MARCH 21, 1955

Price 35 Cents

Electrical World

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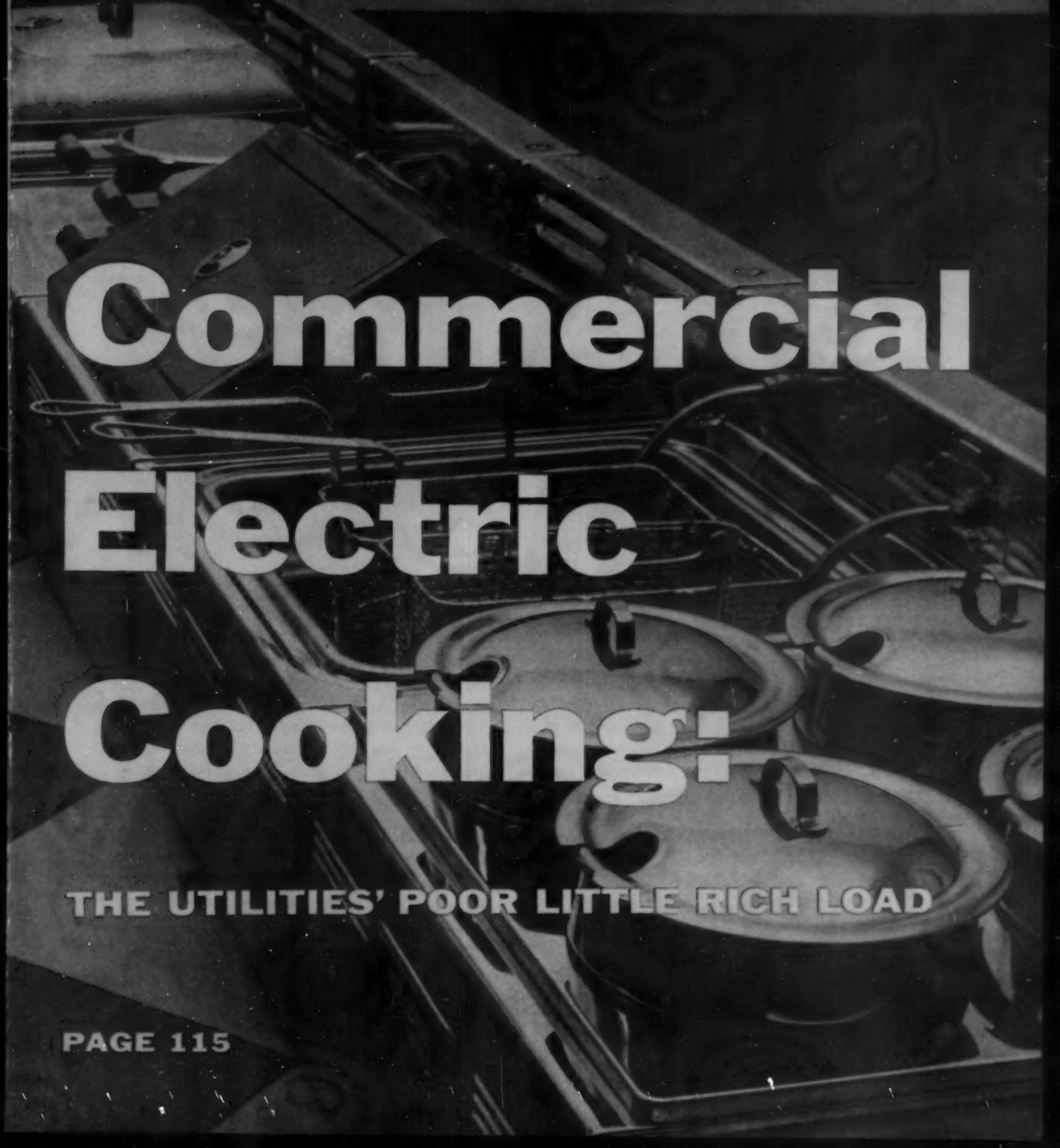

Commercial Electric Cooking:

THE UTILITIES' POOR LITTLE RICH LOAD

PAGE 115

Here's how to carry *double loads* on present wire

ALLIS-CHALMERS
5/8% STEP VOLTAGE REGULATORS

►Most lines have extra copper to take care of voltage drop. This extra copper can carry useful load when Allis-Chalmers distribution regulators control voltage automatically.

Here's why:

Doubling the load doubles the voltage drop. On a line with 10% voltage drop, for example, you can double the load and make the voltage drop 20%. Then, utilizing the ± 10% range of A-C distribution regulators you bring the voltage drop back to 10%.

And the cost is low. The only extra equipment you need are Allis-Chalmers distribution regulators. No wire to buy, no costly labor charges. In addition, you get close voltage control, which produces higher revenue, cuts voltage complaints.

Allis-Chalmers distribution regulators are the ideal solution to load-expanding problems. They bring you high quality regulation at low cost. Get more information. Contact the A-C office nearest you or write Allis-Chalmers, Milwaukee 1, Wisconsin.

A-4632

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Electrical World

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Published for 81 years for those engaged in the business of generating, transmitting, distributing, or applying electric power

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ELECTRICAL WORLD

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This plot has a story for paper cable users

The curves plotted above tell the story of high internal pressure tests made on three lengths of paper cable indentical in construction except for the sheath design.

Cable Sheath #1: Copper-silver-bearing lead of AEIC recommended thickness

Cable Sheath #2: Okometal alloy of AEIC recommended thickness

Cable Sheath #3: Composite design with Okometal alloy of two-thirds AEIC thickness plus Okosheath Protective Covering

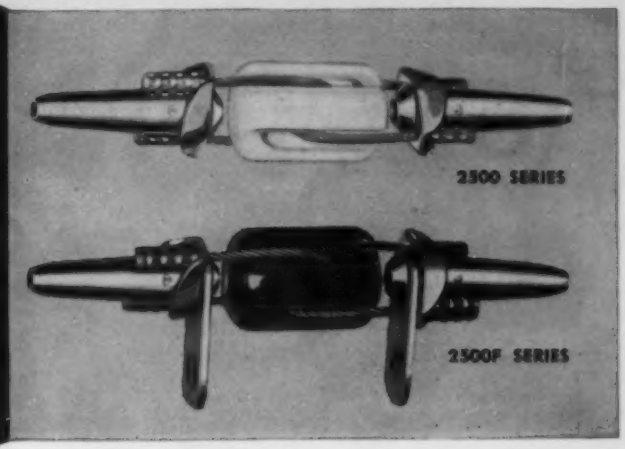
Sheath #1, having the least resistance to internal pressure, started to "neck down" or thin-out at one spot, which led to a rapidly increasing expansion and failure after only 1152 hours on test. Sheath #2, made with unprotected Okometal of full AEIC thickness, was still on test after 6000 hours, indicating its superiority over a conventional lead sheath. Composite sheath #3, made with Okometal of reduced thickness but having an Okosheath Protective Covering, was not only still on test after 6000 hours, but also showed a flat curve that indicated the highest degree of stability with no tendency to "neck down."

Along with the advantages disclosed above, the composite sheath construction of Okometal plus Okosheath Protective Covering possesses superior resistance to scoring during installation and eliminates both chemical and electrolytic corrosion. These features are fully discussed in Bulletin EW-1047, available upon request from The Okonite-Callender Cable Company, Passaic, New Jersey.

1721

for the largest number of line applications at the lowest possible cost...

USE *Electroline* Insulating Automatic Line Splice SECTIONALIZERS



The Electroline Sectionalizers are assemblies that will function in service as most convenient, reliable and yet low cost interrupting devices. Series 2500-F and 2600 provide for paralleling with a fuse element for further protection when sectionalizing. The mechanical strength of these assemblies exceeds in all cases the rated breaking strength of the conductor for which they are adapted.

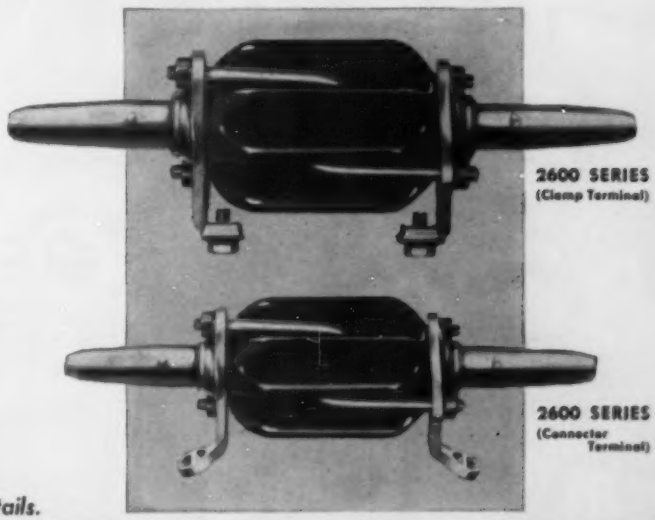
These Insulating Automatic Line Splice Sectionalizers are ideal for:

Installing Regulating Equipment,
simplifies cutting-in disconnecting points, fuses, voltage regulators and series capacitors;

Restoring Service,
providing points to test for trouble;

Sectionalizing Networks,
to readily isolate and test the area in trouble;

Series Street Lighting,
simplifies cutting-in series street lamps—merely cut the line and insert conductor ends into sectionalizer.



Send for Bulletins containing complete details.

TALENT TO ORIGINATE E ABILITY TO PRODUCE

Electroline Company

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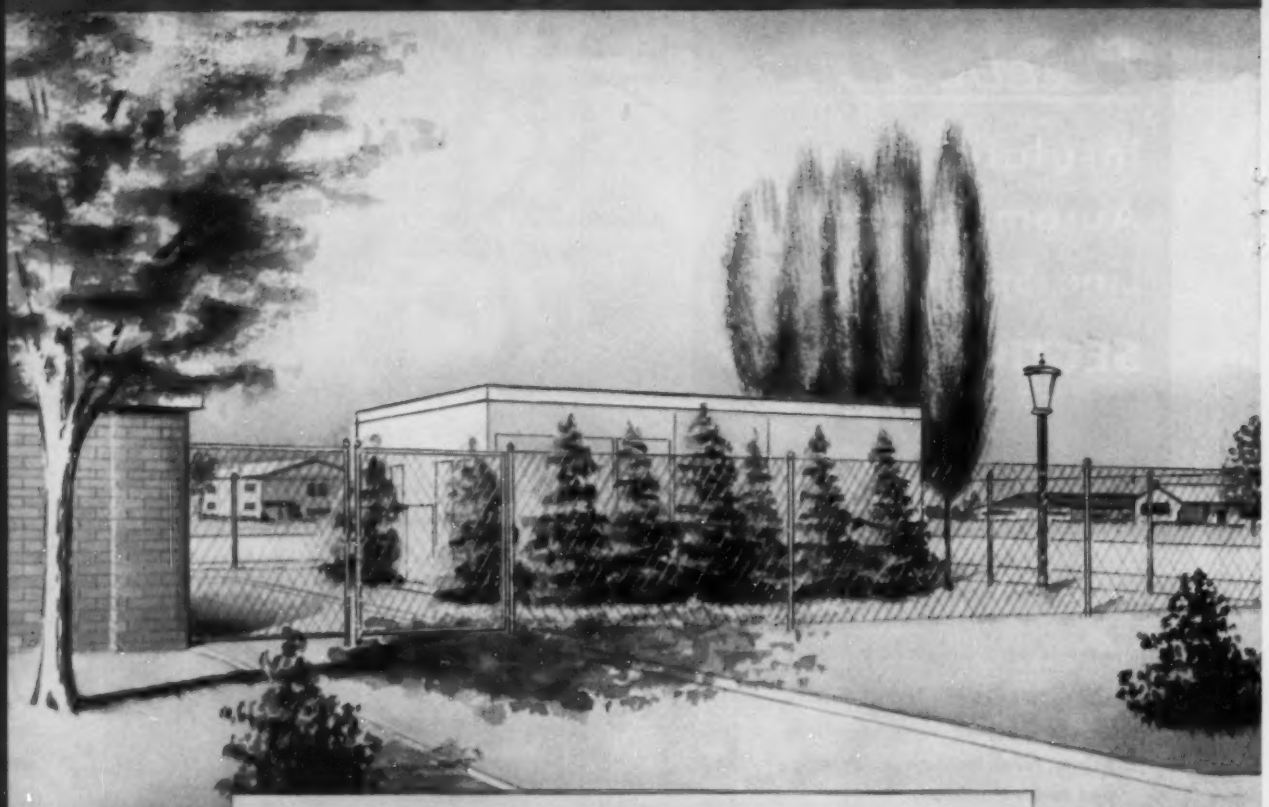
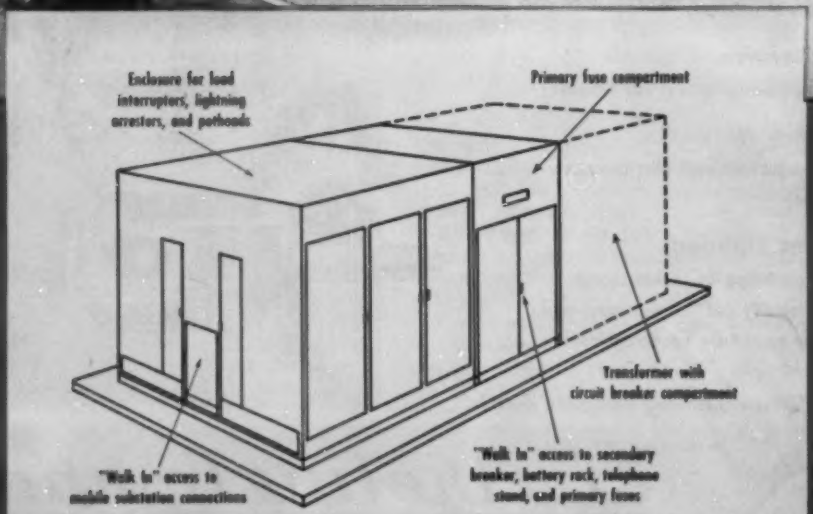
WILL YOUR NEW DISTRIBUTION SUBSTATION




Enclosure for load interrupters, lightning arresters, and pothead
Primary fuse compartment
Transformer with circuit breaker compartment
"Walk in" access to secondary breaker, battery rack, telephone stand, and primary fuses
"Walk in" access to mobile substation connections

HAVE Neighborhood Acceptance?

WILL IT GIVE YOU ZONING BOARD APPROVAL?

With S&C Metalclad Primary Gear you get a compact, attractive, and *Completely* Enclosed Substation for residential areas—even when the primary service is 34.5 kv

Plus THESE EXTRA ADVANTAGES

- Tamper-free metalclad construction: High voltage is locked in . . . intruders are kept out—and safe
- Simple, *packaged* installation that saves the time and cost of piecemeal open construction
- *Reliable protection* and ability to switch under all conditions, except short circuit
- New conveniences in operating and maintenance

Incorporated in the unit on the left are these operating features:

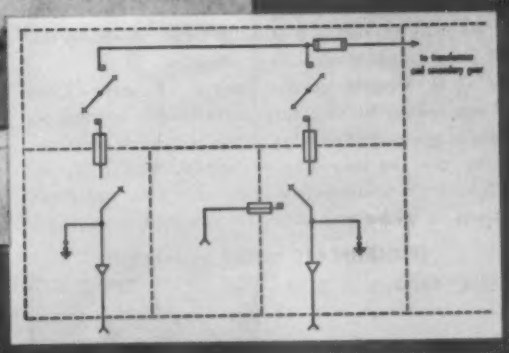
1) Pothead isolation—for protection of operators during maintenance

2) Disconnecting provisions to isolate load interrupters, to by-pass entire substation, and to feed mobile substation

3) Integral housing of control panels, battery rack, work stand, telephone stand. Elimination of need for unsightly tool shacks

4) Shelter for maintenance of secondary gear

5) Unit capsuled for shipment in one piece



Circuit diagram of the S&C Metalclad Primary Gear for the distribution substation illustrated. The gear is equipped with Type SM Power Fuses and Alduti Type Load Interrupters with provision for remote control operation.

S&C ELECTRIC COMPANY

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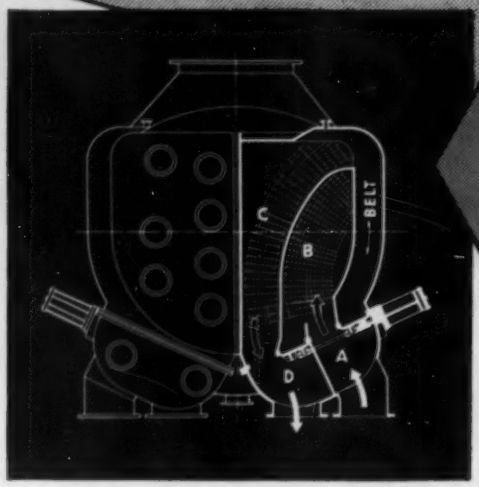
POWER FUSES • DISTRIBUTION CUTOUTS AND FUSE LINKS • LOAD INTERRUPTERS • METALCLAD SWITCHGEAR

Specialists in High-Voltage Circuit Interruption

C. H. WHEELER "SELF CLEANING" PATENTED REVERSE FLOW STEAM CONDENSER



REVERSE FLOW

Illustrated is the C. H. Wheeler tandem arrangement in which both sluice gates operate on a single stem. In this divided water box condenser, water enters chamber A with left hand port open and flows in through pass B, out through pass C and through left hand port D. To reverse the flow, gates move to left, closing the left hand ports and opening the right hand ports of chambers A & D. Water now flows through bolt, in through C and out through B and right hand port of D. The same method applies, of course, to a non-divided water box design.

No Shutdown — No Vacuum Loss for Tube Cleaning

The C. H. Wheeler Patented Reverse Flow design makes either single or divided water box steam condensers self-cleaning. These condensers are saving power plants countless hours of downtime and reduced load formerly required for manual removal of debris and organic growth from clogged tube sheets.

"Self-Cleaning" is accomplished by a set of sluice gates built integrally into C. H. Wheeler Surface Condensers which may be electrically or hydraulically operated to reverse the flow of cooling water through the tubes. This sudden flushing-in-reverse removes all debris and crustaceous matter and carries it out the discharge while carrying full load on the turbine and without reducing water flow. Also, the quick change in temperature shocks and dislodges marine growth.

Depending on condition of the cooling water, C. H. Wheeler Reverse Flow condensers have gone two years and longer before requiring cleaning. A typical field report tells of regaining a half-inch loss of vacuum (due to fouled tubes and tube sheets) five minutes after reversing the flow of condenser cooling water.

C. H. Wheeler custom - designs Reverse - Flow Condensers to suit any installation, arranging sluice gates and nozzles at top or bottom of water box and at any angle desired. Call a C. H. Wheeler representative to go over your specifications. It will mean years of substantial savings.

(BULLETIN 410 mailed on request)

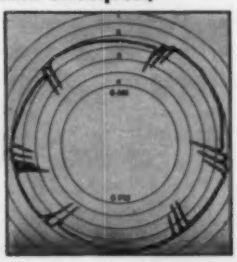
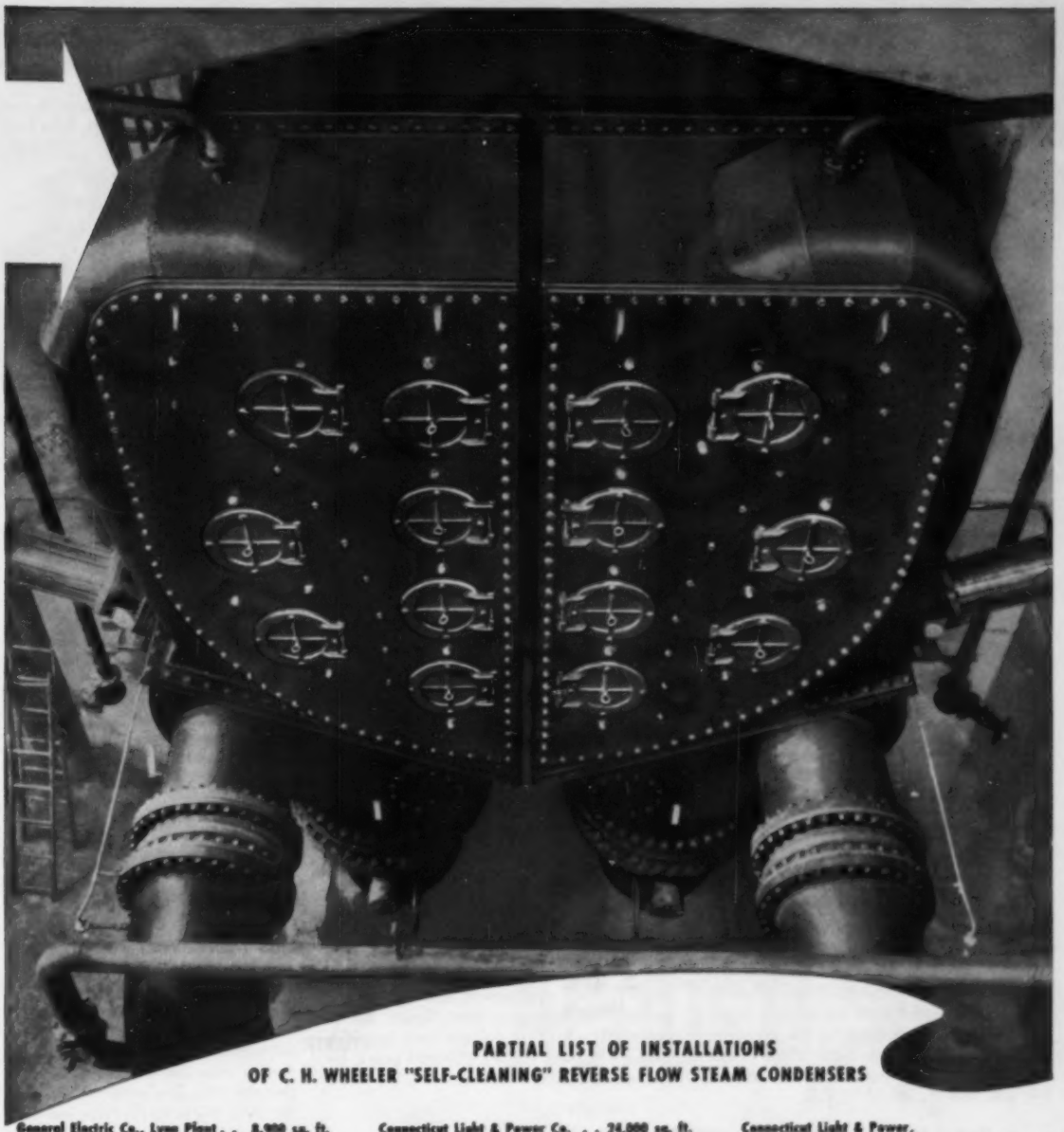


Chart shows typical cycle of vacuum and effect of reverse flow in a C. H. Wheeler Patented Self-Cleaning Reverse Flow Condenser. Note that because of 100% back flushing, the loss of vacuum during the reverse flow cycle is negligible.



PARTIAL LIST OF INSTALLATIONS
OF C. H. WHEELER "SELF-CLEANING" REVERSE FLOW STEAM CONDENSERS

General Electric Co., Lynn Plant . . 8,900 sq. ft.
General Electric Co., Lynn Plant . . 12,500 sq. ft.
Keystone Steel & Wire, Peoria . . 10,000 sq. ft.
Virginian Railways, W. Va. . . . . 15,000 sq. ft.
City of Wyandotte, Mich. . . . . 12,000 sq. ft.
City of Kansas City, Kansas. . . . 32,500 sq. ft.
New Bedford Gas & Edison Light, New Bedford, Mass. . . . 16,500 sq. ft.
New Bedford Gas & Edison Light . 25,000 sq. ft.
Connecticut Light & Power Co., Montville Station . . . . . 24,000 sq. ft.
Connecticut Light & Power Co. . . 24,000 sq. ft.
Connecticut Light & Power Co. Devon Station . . . . . 50,000 sq. ft.
Georgia Power Co., Atkinson Station, 47,000 sq. ft.
Alabama Power Co , Units 1 & 2 Gadsden Station . . . . . 47,000 sq. ft.
City of Holland, Michigan . . . . . 13,000 sq. ft.
South Carolina Electric & Gas, Unit #1 Urquhart Station . 45,000 sq. ft.
South Carolina Electric & Gas, Unit #2 Urquhart Station . 45,000 sq. ft.
Connecticut Light & Power, Montville Station . . . . . 55,000 sq. ft.
Monongahela Power Company, Albright #3 . . . . . 65,000 sq. ft.
Georgia Power Company, Hammond Station, Units 1-2-3, 74,000 sq. ft.
City of Jacksonville, Fla., Southside Station . . . . . 40,000 sq. ft.
Tallyrand Station . . . . . 40,000 sq. ft.

C. H. WHEELER *of Philadelphia*

C. H. WHEELER MANUFACTURING CO., 19th & LEHIGH, PHILADELPHIA 32, PENNA.

Steam Condensers • Centrifugal, Axial and Mixed Flow Pumps • Steam Jet Ejectors • Vacuum Refrigeration
High Vacuum Process Equipment • Mica Particle Reduction Mills • Marine Condensers and Heaters • Deck Machinery

"It costs us only 34¢ for every $1.00 of new revenue commercial cooking brings in!"

... Carl T. Bremicker, Vice President, In Charge of Sales, Northern States Power Co., Minneapolis, Minn.

What is new E.A.R. worth? Many utility executives often use the rule-of-thumb that says you can spend $1.00 to get $1.00. But up at the Minneapolis headquarters of Northern States Power, the records show that an all-out drive for commercial cooking load is building a *whole new business* for this great Minnesota utility—and at a cost of just 34c per new $1.00 of E.A.R.

"In 1950," points out vice president Carl T. Bremicker, "E.A.R. from commercial cooking totalled $60,000. Our determination to go after the market with trained manpower and aggressive promotion brought that figure up to over half a million dollars back in 1953, and we'll pass the $1,000,000 mark by the end of 1955!"

How Can You Promote Commercial Electric Cooking In Your Territory?

Yes, a great potential exists in commercial cooking. However, maximum returns require *thorough* promotion. Here are the essentials of Northern States Power's program:

- calls and *repeat* calls on food service operations.
- display and demonstrations.
- sales contests.
- training courses for company and dealer salesmen.
- trial use of counter line equipment.
- free service for one year on equipment sold.

Results? 75% of all trial equipment was sold—for an increase of 2.85 kw per operator!

"It's surprising that the profit potential in commercial cooking needs to be advertised ..."

J. Roscoe Furber, Gen. Sales Mgr.

"... because we know of so many utilities that have been so tremendously successful in commercial cooking promotion that we assumed it already had universal recognition as an indispensable revenue-building medium."

"Year 'round promotion makes commercial cooking big business!"

Walter E. Gilbert, Manager, Industrial Sales

"Unlike lighting, refrigeration and air conditioning, commercial cooking doesn't *have* to go electric! If we eased up on commercial cooking promotion tomorrow (which we have no intention of doing!), new revenues would soon slip back to old levels, because there is real competition for this load. Its characteristics are very nearly ideal."

"Promotion program to be enlarged, public service to be continued."

John C. Newhouse, Supervisor, Industrial Sales

"Much of our commercial cooking market is still untapped. As a result, we intend to enlarge our promotion even further this year. And while we are adding kw's, this program helps our customers increase their profits, too! For instance, the Dutch Mill Night Club, Minot, North Dakota, replaced two competitive 110-lb. fry kettles with one 28-lb. capacity Hotpoint Mark 313 electric frying machine, at a savings of $45.00 a month in fat alone!"

YOU CAN MATCH THE NSP SAGA

The time is now. Why not share our commercial cooking services and programs? Write and I will give your letter my personal attention.

Orrin E. Wolf.

Orrin E. Wolf, Vice President, Hotpoint Co.

Hotpoint ALL ELECTRIC Commercial Cooking Equipment

Hotpoint Co. A Division of General Electric Company

Commercial Equipment Department, 227 South Seeley Avenue, Chicago 12, Illinois

ALLIS-CHALMERS presents

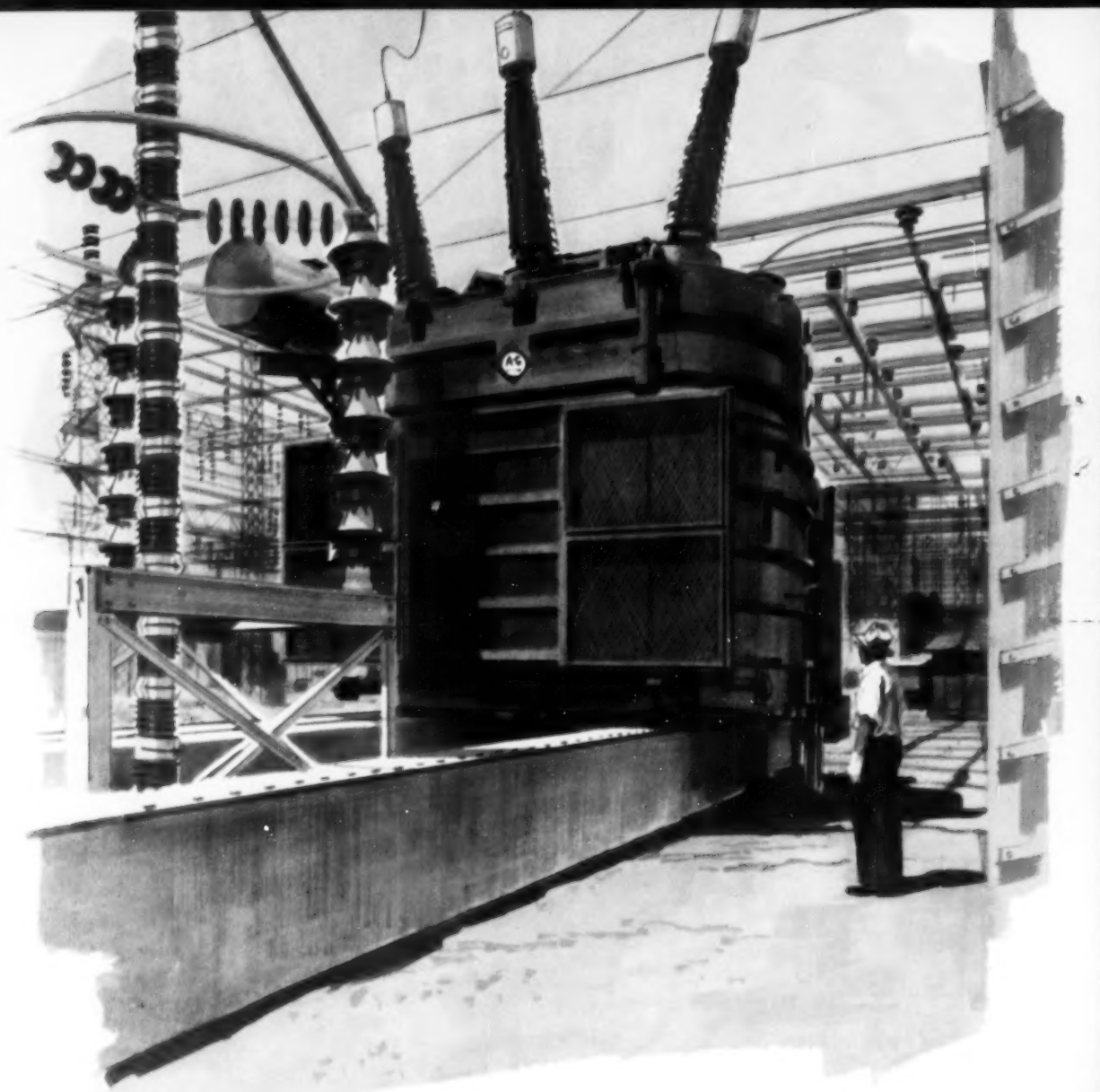
1. **10-Acre Acoustical Proving Ground**
2. **Mobile Sound Research Unit**
3. **Allis-Chalmers Sound Laboratory**

Transformer Acoustical Survey Service

A-4503

ALLIS-CHALMERS

Milwaukee 1, Wisconsin



To help meet an increasing problem, Allis-Chalmers has conducted extensive research into magnetostriction, core construction, tank design, and many other factors. This 150,000-kva power transformer typifies advances in the art of transformer design achieved through this development program. The result has been transformers with progressively lower sound levels.

Present progress in research indicates promise of even lower sound levels produced economically in transformers of the future. Investigations into the problem indicate, however, that there may be steps utilities can take now to bring about solutions to problems caused by sound. The new Acoustical Survey Service is designed to place in the hands of utilities the advanced techniques and equipment necessary.

Meanwhile, through constant research and ever-improving manufacturing techniques, Allis-Chalmers will continue to bring utilities better and more economical transformers to meet the demands of an expanding power industry.

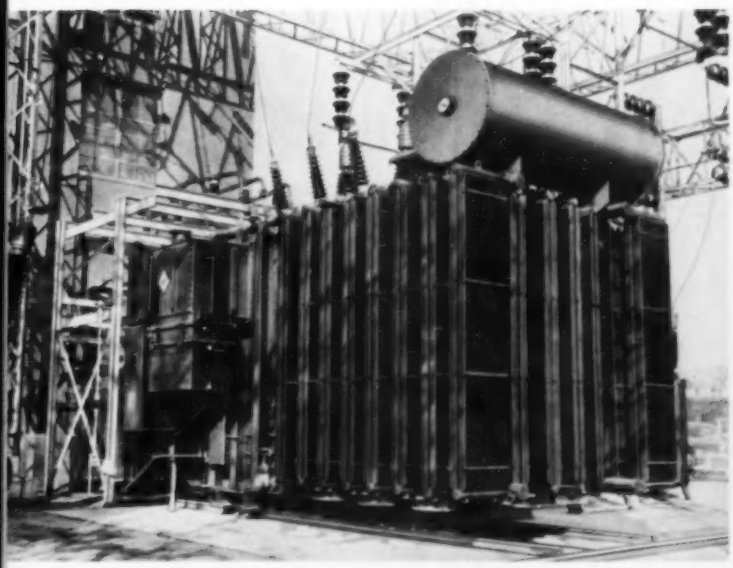
Transformer Acoustical Survey Service

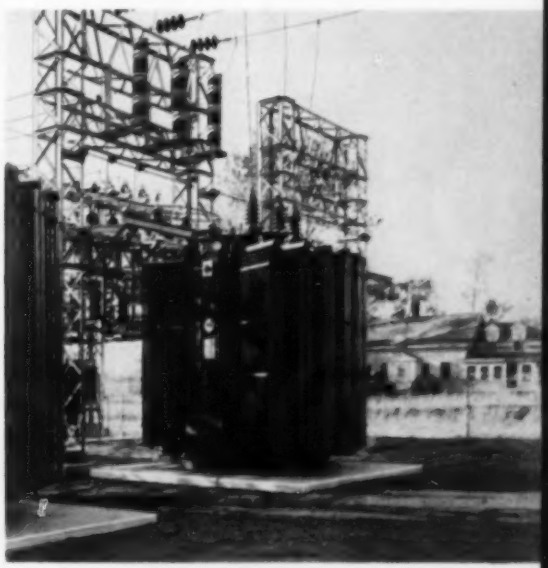
Analyzing A Problem Before It Grows

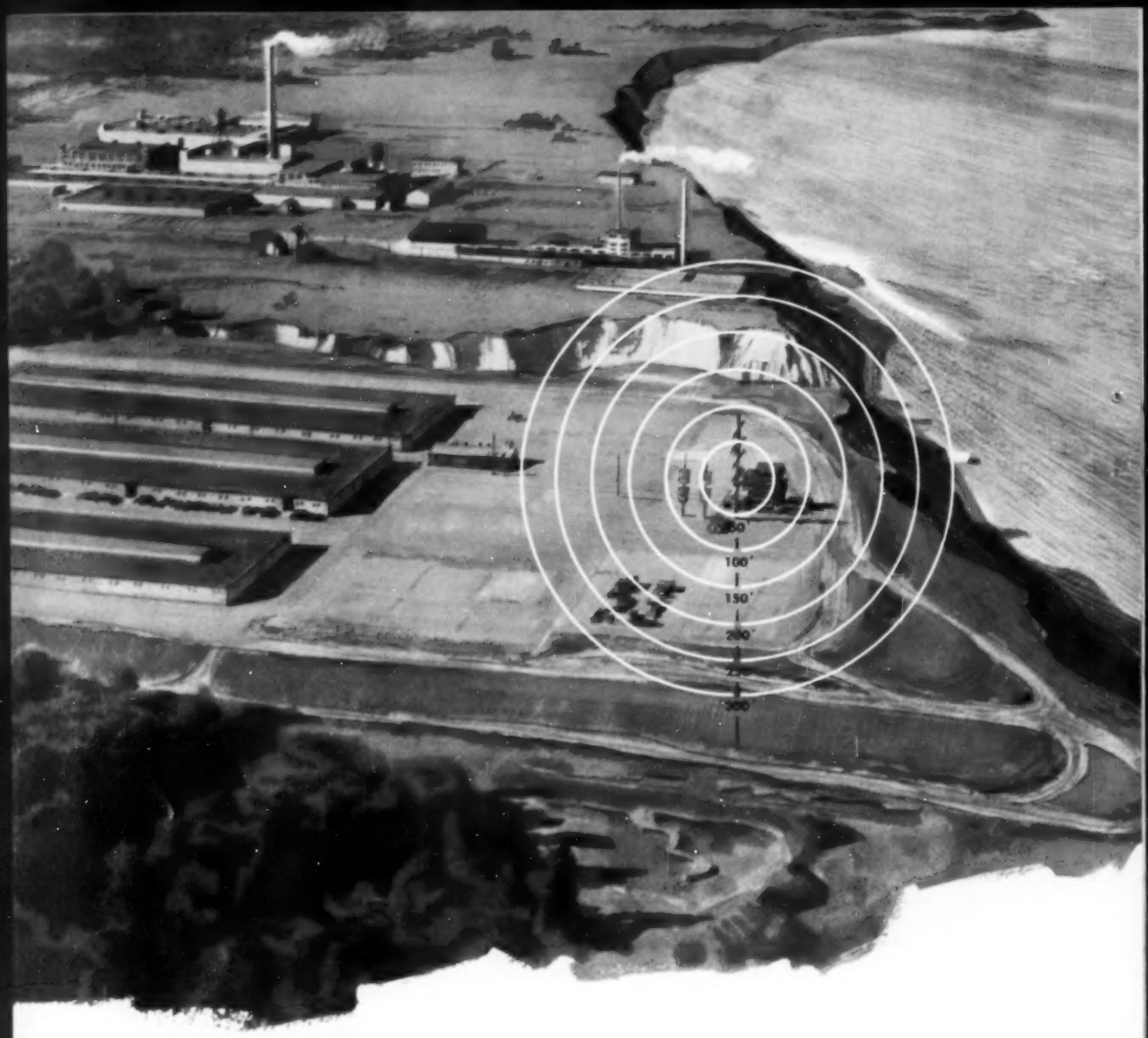
ALLIS-CHALMERS is introducing a new Acoustical Survey Service to provide utility engineers a means of coping with the problems caused by the installation of progressively larger transformers. Now utility engineers will be able to analyze problems caused by noise levels even before purchasing a new transformer for addition to an old substation or the construction of a new one.

Here's how the Acoustical Survey Service works: With the Allis-Chalmers mobile sound research unit you can analyze many of the phases of sound problems in a given area. You can examine problems caused by contour, landscaping, location of buildings, and many other causes of noise in the area.

With this data you can make use of either the Allis-Chalmers sound laboratory or the Ten-Acre Acoustical Proving Ground. The next few pages outline the extensive facilities Allis-Chalmers is providing to utility engineers for this purpose.





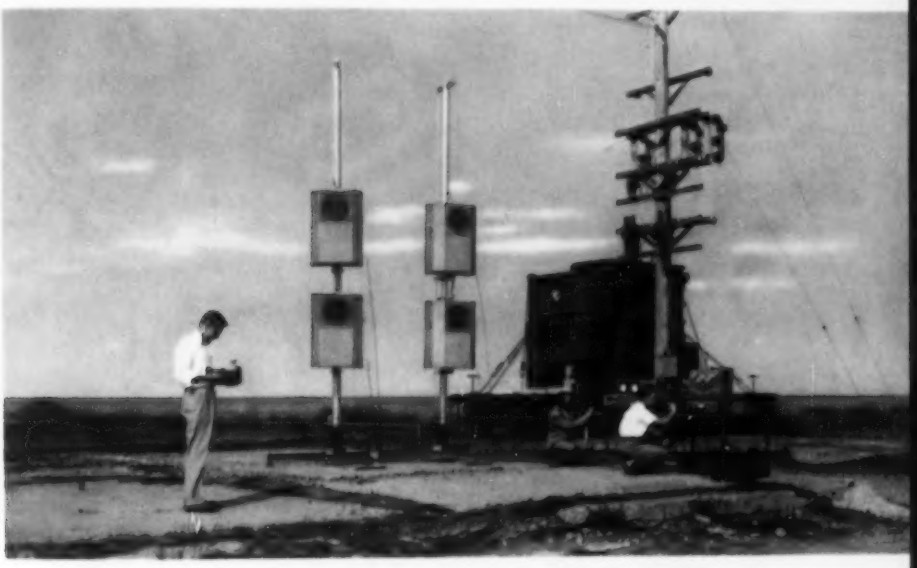


Ten-Acre Acoustical Proving Provides First Practical Means for

Low sound levels and unlimited space make the new Allis-Chalmers Acoustical Proving Ground at Carrollville, Wisconsin, the first *practical* means for field-testing transformers. Ambient sound levels are lower than those which might be encountered at most installations where noise may cause a problem. And space requirements of any standards are far exceeded. There is no reflective surface within hundreds of feet of the transformer location.

Complete testing facilities are available to simulate field problems. In addition to low ambient levels and unlimited space, the Proving Ground equipment includes means for duplica-

AERIAL VIEW OF PROVING GROUND shows transformer which has been moved in on specially constructed railroad spur. Transportation facilities can handle largest transformers, or an acoustical transformer can be used to reproduce the sounds of any size or type transformer.



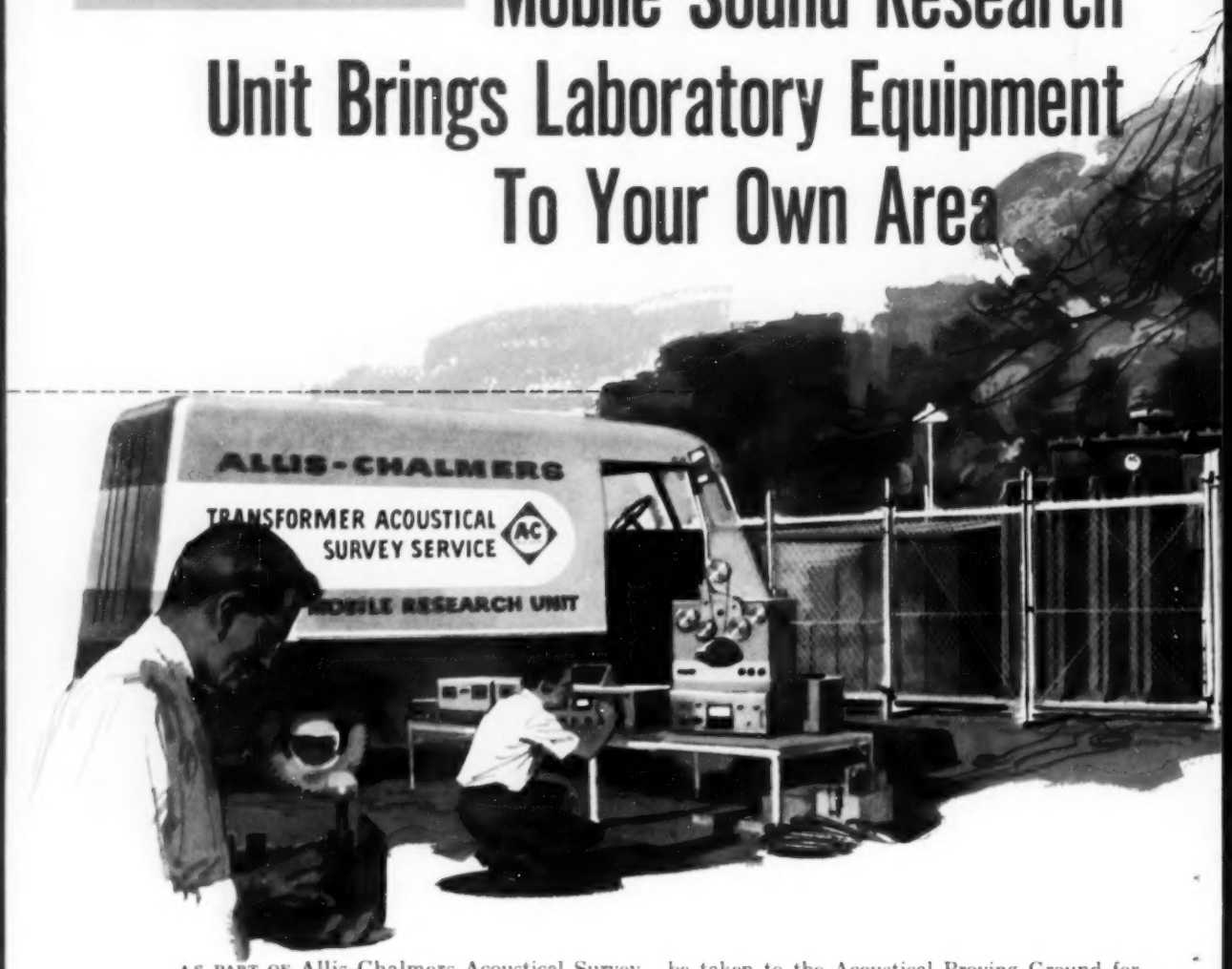
Ground Sound Level Testing

tion of any area acoustically. Brick walls, Fiberglas-insulated walls, landscaping or any type of equipment that helps improve sound levels can be simulated. There is also adequate space to construct any of the necessary baffles or walls to meet the requirements of a specific test.

Transformer Acoustical Survey Service

Transformer Acoustical Survey Service

Mobile Sound Research Unit Brings Laboratory Equipment To Your Own Area



As part of Allis-Chalmers Acoustical Survey Service the Mobile Sound Research Unit places a means for analyzing sound problems directly in the hands of utility engineers. With this unit you can test or record the aspects of a sound problem right on the spot where it occurs.

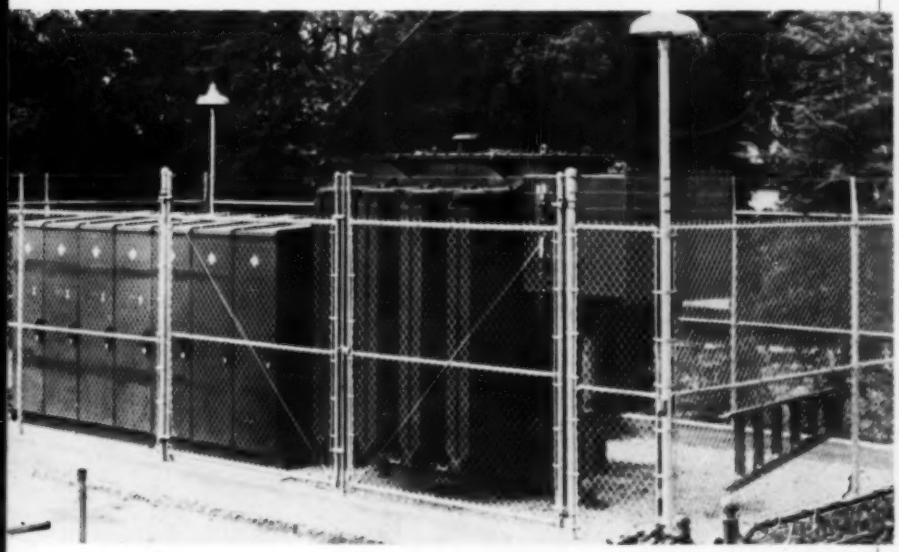
Or you can test areas where substations are planned, deciding on the basis of these measurements the sound level to which a transformer should be designed. The mobile unit will also help decide what remedial steps can most economically be taken if a sound problem develops after a transformer or substation is installed.

The evidence gained from on-the-spot tests can be taken to the Acoustical Proving Ground for further tests. Or you can place an acoustical transformer — which will exactly simulate the sound of an actual transformer of any type or rating — in the new substation area to check the effect on surrounding areas. Thus the exact sound conditions can be established long before the final decision on equipment has to be made.

Allis-Chalmers Mobile Sound Research Unit includes equipment necessary to make tests on almost every phase of a sound problem. In addition, Allis-Chalmers will provide experts who will operate equipment and advise you on the most effective testing to get answers to your questions.

Duplicate Your Area At Acoustical Proving Ground

With data obtained from these tests, you can duplicate the sound problems of your own area at the Acoustical Proving Ground. There Allis-Chalmers will set up similar conditions. In addition, Allis-Chalmers will provide acoustical transformers that will duplicate the noise levels and frequencies created by transformers of whatever rating and type you choose. You can then analyze, *in advance of purchase of any equipment*, the noise levels that will be created by addition of a transformer to your own substation.

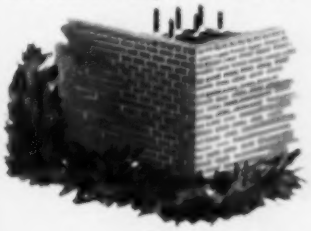


Make Acoustical Tests In Your Own Substation

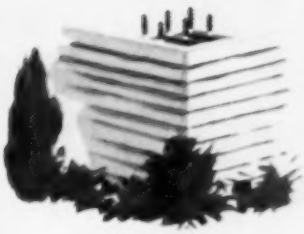
If desired, an Allis-Chalmers acoustical transformer can be set up at your location. When noise levels are created exactly equivalent to those caused by operation of the size and type transformer you choose, you can check all parts of the area with the Mobile Research Unit to determine acceptable sound levels.

Choose Best Solution For Specific Area

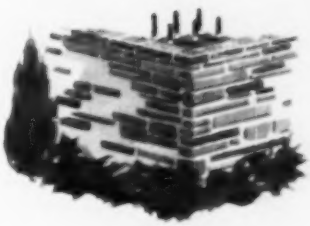
The facilities provided by Allis-Chalmers Acoustical Survey Service will help you decide which is the best and most economic means for solving a sound problem. Brick walls, Fiberglas-insulated walls, wooden walls, stone, landscaping can all be tested and analyzed for possible results in your own area.



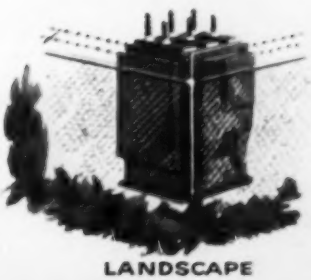
BRICK



WOOD



STONE



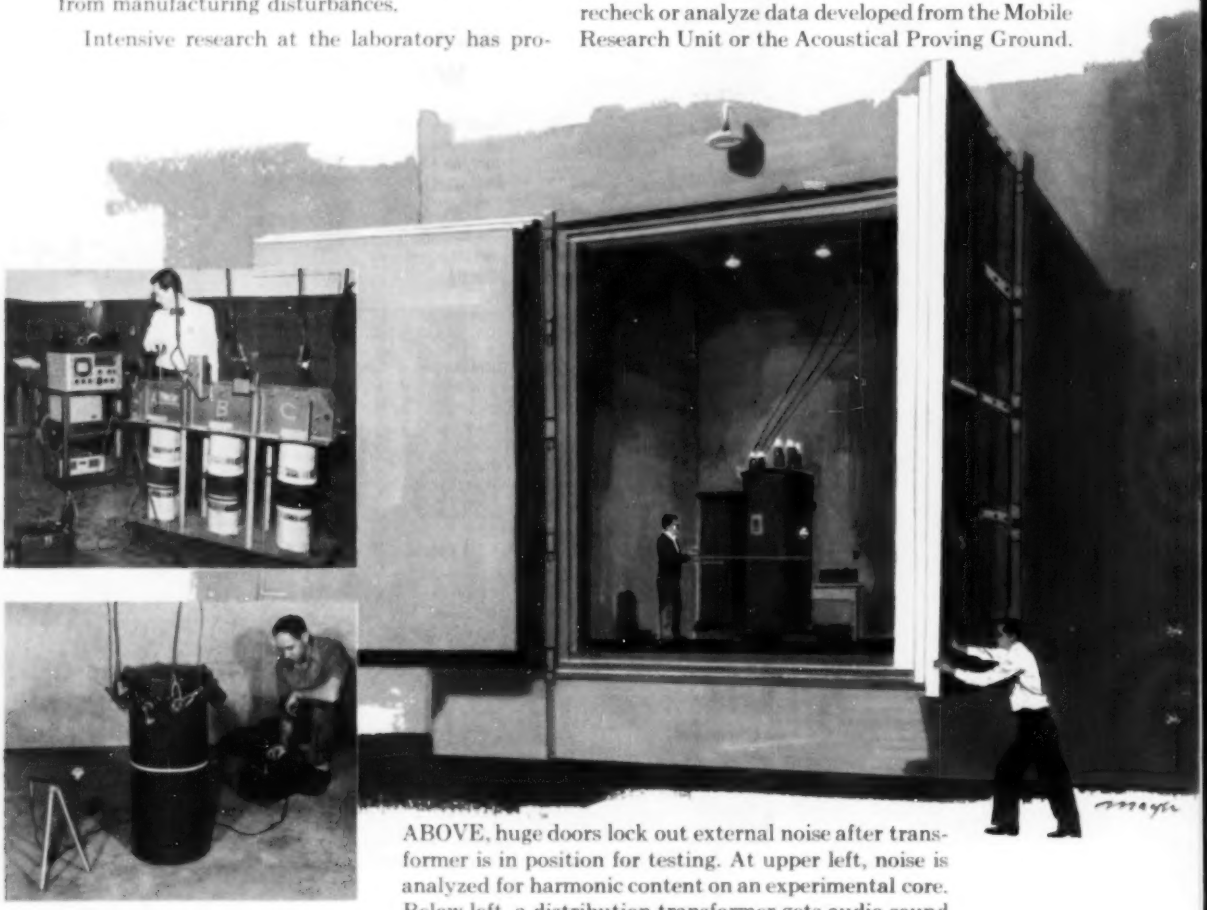
LANDSCAPE

Allis-Chalmers Sound Laboratory Provides Research In Magnetostriction and Resonance

Modern, complex equipment for accurate audio sound measurement under laboratory conditions is housed within the thick walls of concrete, glass wool and acoustical barriers of the Allis-Chalmers Sound Laboratory at Pittsburgh. This building has its own foundation — it is completely isolated from manufacturing disturbances.

Intensive research at the laboratory has produced data that helps design uniformly quiet transformers through a wide range of sizes. Proof has come from field tests which have shown reduced sound levels at transformer installations.

Where advisable, the facilities of the Allis-Chalmers Sound Laboratory will be available to recheck or analyze data developed from the Mobile Research Unit or the Acoustical Proving Ground.



ABOVE, huge doors lock out external noise after transformer is in position for testing. At upper left, noise is analyzed for harmonic content on an experimental core. Below left, a distribution transformer gets audio sound level tests. Frequency analyses of transformer noise and harmonic index are among new tools in the measurement of sound energy.

A-C ALLIS-CHALMERS

ALLIS-CHALMERS

Milwaukee 1, Wisconsin

And Now...

RCA Announces the FIRST Low-Cost Packaged Microwave with Voice Channels

PROVED throughout the nation and the world, RCA 960 megacycle Microwave is now available in a low-cost "package" unit, MM-9, as a complete station.

Important savings include:

- **Minimum real estate requirements**
- **No tower construction**
- **Easy economical installation**
- **Minimum maintenance**
- **Unattended reliable operation**

When mounted on inexpensive supports, such as wooden poles, up to 100 feet high, or on existing structures, which can be spaced 20 or more miles apart, the MM-9 Microwave "package" units provide an ideal low-cost solution to many point-to-point communications problems.

RCA Microwave uses highly directional radio signals which are beamed from one relay station to the next by "dish" antennas. It can be interconnected with existing telephone lines and switchboards and virtually eliminates the weather hazards of carrier and wire lines. RCA Microwave employs readily available tubes and familiar circuits which are easy to service. The RCA Service Company provides nationwide installation and service facilities, if desired.

For complete information on the new MM-9 Packaged Microwave Stations, send coupon, below.

Typical Uses of MM-9 Packaged Microwave:

1. Telephone Circuits
2. Supervisory Control
3. Remote VHF Control
4. Facsimile
5. Teletype

FOR

- Gas Utilities
- Electric Utilities
- Pipelines
- State Agencies
- Municipal Systems
- Police Departments
- Transportation Systems

Showing hinged rack construction, with all components easily accessible for servicing. Standard "package" equipment includes weather-proof cabinet, 2 parabolic reflectors, 960 megacycle transmitter unit, exciter unit, 960 megacycle receiver. Also 2 100-ft. sections of semi-flexible transmission lines with all required fittings. Space is available for multiplex equipment to provide two voice channels with signaling. Additional multiplex equipment can be mounted in a similar cabinet.

RCA

RADIO CORPORATION of AMERICA

COMMUNICATIONS EQUIPMENT
CAMDEN, N. J.

Radio Corporation of America, Camden, N. J.
Dept. O-45, Building 15-1
In Canada, RCA VICTOR Company Limited, Montreal
Please send me your new booklet, "RCA Low-Cost Packaged Microwave Stations."

NAME_____ TITLE_____

COMPANY_____

ADDRESS_____

CITY_____ ZONE____ STATE_____

☐ *Have an RCA representative get in touch with me.*

Expanding the source for Utility Revenue!
An Electric Range for Every Purse and Purpose
in the Hotpoint
Golden Anniversary Range Line
...at prices ranging from $189.95 to $499.95

HOTPOINT SUPER DE LUXE DOUBLE OVEN LIGHTED PUSHBUTTON AUTOMATIC ELECTRIC RANGE

- NEW Super Speed Calrod® ... World's Fastest Surface Unit
- NEW Handi-Raise Broiler and Handi-over Grill
- NEW GIANT Super Oven and NEW Rota-Grill
- NEW Plug-In Golden Griddle
- NEW Automatic Meal-Timer

HOTPOINT DE LUXE PUSHBUTTON AUTOMATIC ELECTRIC RANGE

- NEW Super SPEED Calrod Surface Unit
- GIANT Super Oven Color-Keyed Pushbutton Controls
- Plug-In Golden Griddle and Golden Fryer Available
- Raisable Thrift Cooker
- Time Saving Time Center
- Golden Bake and Golden Broil Calrod Units

HOTPOINT SUPER-30 AUTOMATIC ELECTRIC RANGE

- NEW Super SPEED Calrod Surface Unit
- Automatic Rota-Grill and Thrift Broiler
- Raisable Thrift Cooker with provision for Plug-In Golden Fryer
- Golden Bake and Golden Broil Calrod Units
- GIANT Super Oven and Automatic Time Center

HOTPOINT STANDARD AUTOMATIC ELECTRIC RANGE

- New Super SPEED Calrod Surface Unit
- GIANT Super Oven with Oven Signal Light
- Golden Bake and Golden Broil Calrod Units
- Reversible Rota-Switches
- Electric Appliance Outlet
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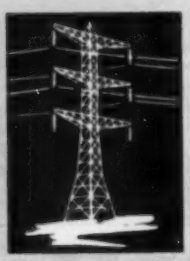
HERE ARE JUST FOUR MODELS IN A COMPLETE LINE THAT OFFERS . . .

Again, Hotpoint



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Have Your Hotpoint Distributor Show You the *Complete* Line Which Includes the Sensational Hotpoint Customline *Built-in Electric Range Ensemble* . . . and *show* this great line on your display floor.

looks at Tomorrow, Today!

HOTPOINT CO. *(A Division of General Electric Company)* **5600 West Taylor Street, Chicago 44, Illinois**

Note / *Our long experience in working with both utilities and the public is your assurance of dependable work and good customer relations.*

Bartlett scientists lead in tree research . . .

First
to introduce a complete, balanced shade tree food—"Bartlett's Green Tree Food"—and to devise feeding through holes in the ground.

First
to use power spray equipment for shade trees and to develop a practical method of reinforcing weak trees with eyebolts and cable process.

First
to produce a satisfactory flexible material for filling tree cavities. "Flexifil" has almost the same expansion coefficient as wood.

First
to introduce a special type of "Heal Collar" to expedite the growth of smooth, even new bark over the filler used in cavities.

First
to develop the "Invigorator Process"—sub-irrigation of shade trees with liquid food and conditioning chemicals under high pressure.

First
to maintain Tree Research Laboratories with a highly trained staff of nationally known scientists to study shade tree problems.

First
to successfully control one specific disease of trees by the use of chemicals introduced directly into the sapwood of the tree.

The list of "firsts" will never end at the Bartlett Tree Research Laboratories. Here, scientists are continually searching for new and better ways to protect the shade trees of America. When you consult your local Bartlett representative, you get the benefit of not only his local, native talent, but you also get the benefit of the combined scientific knowledge and long practice of a group including some of the leading authorities in tree health and protection. Small wonder those critical of results are turning to the Bartlett Way—the Scientific Way. Call the nearest Bartlett Office for a study of your tree situation.

The Bartlett Way

BARTLETT TREE EXPERTS

Home Office, Research Laboratory and Experimental Grounds, Stamford, Conn.
Local Offices from Maine to the Carolinas, and West to Indiana.
See your Local Telephone Directory for Local Address.

NOW . . . 26 million pounds of steam/hr. generated by RILEY units with the

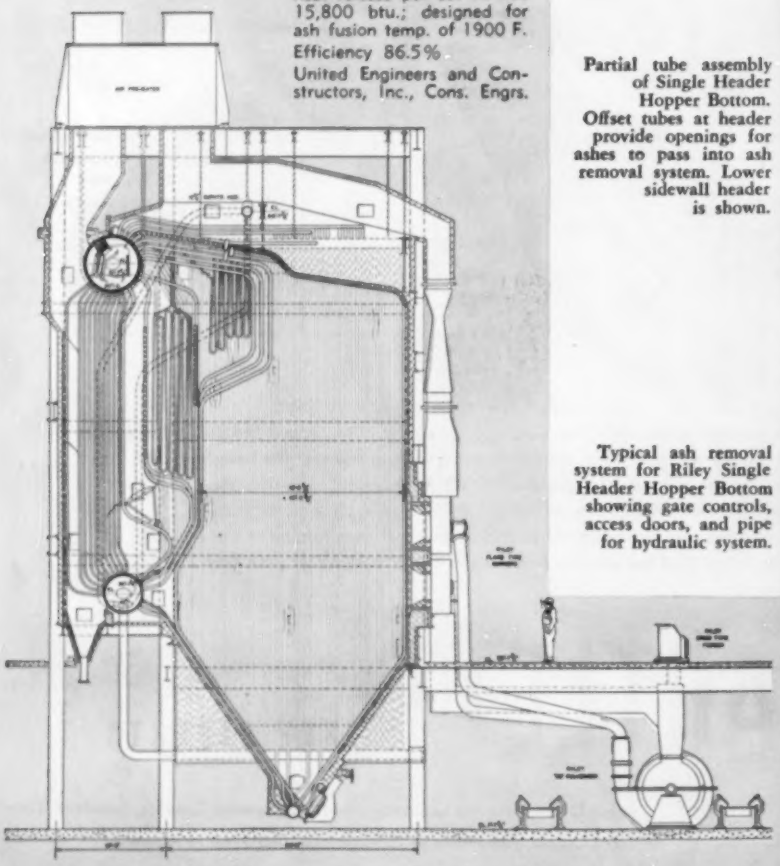
*SINGLE HEADER HOPPER BOTTOM

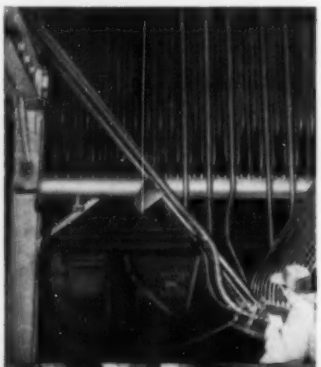
. . . a design recommended by scores of power plant engineers and consulting engineers for its satisfactory operation and money-saving features.

*Patented

Western Electric Company Hawthorne Works, Chicago, Ill.

Capacity 150,000 lbs/hr. 835 F/1000 psig; furnace heat release per cu. ft. vol. 15,800 btu.; designed for ash fusion temp. of 1900 F. Efficiency 86.5%. United Engineers and Constructors, Inc., Cons. Engrs.



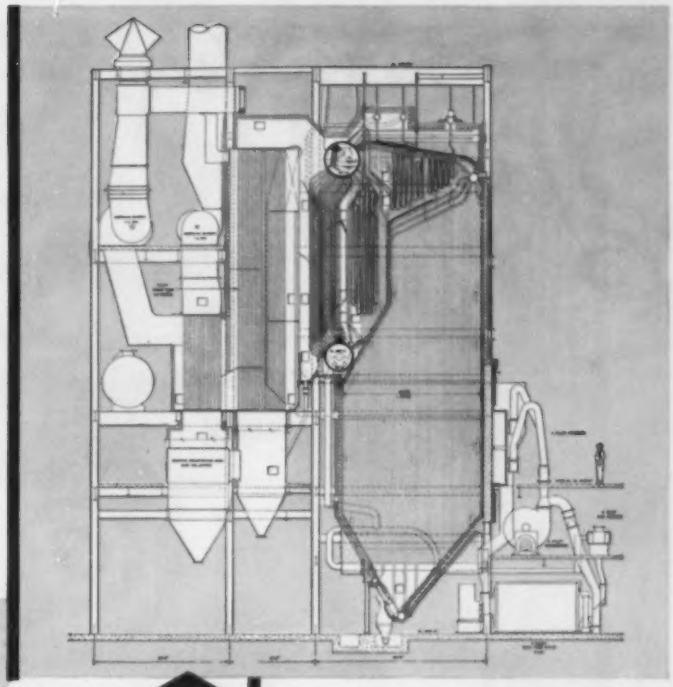


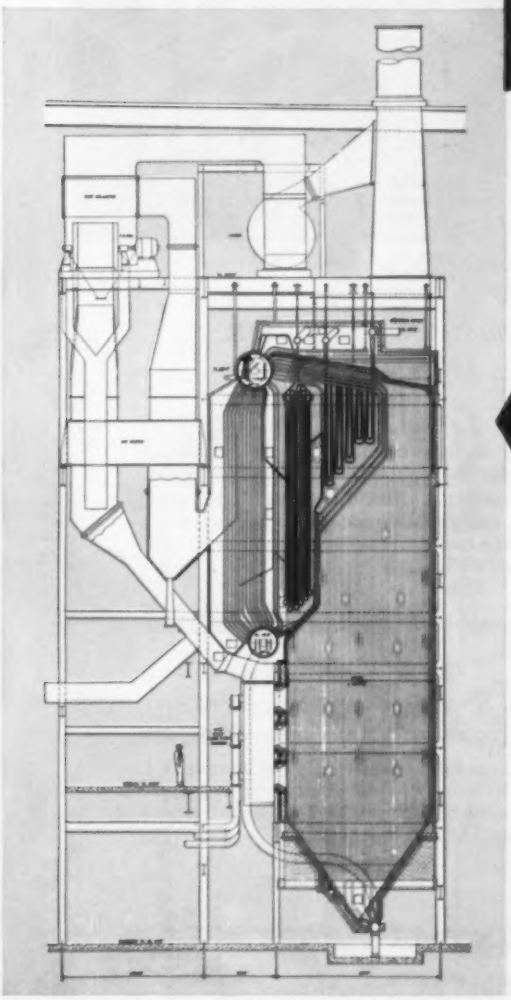
Partial tube assembly of Single Header Hopper Bottom. Offset tubes at header provide openings for ashes to pass into ash removal system. Lower sidewall header is shown.

Typical ash removal system for Riley Single Header Hopper Bottom showing gate controls, access doors, and pipe for hydraulic system.

Your nearest Riley Representative will gladly furnish you with further details about Riley Single Header Hopper Bottom installations, or write to Riley Stoker Corporation, Dept. A, Worcester, Massachusetts.

- Successful with all types of high ash coals, even with ash fusion temperatures as low as 1900 F. No ash removal difficulties.
- Ideal for units firing a combination of coal, oil and/or natural gas, or, where coal may be used in the future.
- Integrated design eliminates the cost of separate hopper, and seals between unit and hopper with their maintenance.
- A convenient pneumatic or hydraulic ash removal system may be added.
- Reduces over-all building height . . . permits higher capacity unit in existing building.
- Adaptable to units of any capacity.





Dairyland Power Cooperative
Cassville, Wisconsin
Capacity 230,000 lbs/hr; 900 F/1000 psig; furnace heat release per cu. ft. vol.-19,300; designed for ash fusion temp. — 1980 F. Efficiency 86.0%
Vern E. Alden Co., Consulting Engineers.

South Carolina Public Service Authority
Moncks Corner, S. C.
Capacity 450,000 lbs/hr.; 900 F/925 psig; furnace heat release per cu. ft. vol.-17,000; designed for ash fusion temp. — 2150 F. Efficiency 87.7%
Ford, Bacon & Davis, Consulting Engineers.

A few users of over 150 units sold

Otter Tail Power Co.
Central Ohio Light & Power Company
Bird & Son, Inc.
So. Nevada Power Co.
Upper Peninsula Generating Company
Western Colorado Power Co.
City of Rochester, Minnesota
Central Electric Power Corporation, Linn, Mo.
Waldorf Paper Products, Inc.
Esso Standard Oil Co.
General Electric Co.
Allis-Chalmers Manufacturing Co.
Ohio Oil Company
Goodyear Tire & Rubber Company
Hooker Electrochemical Co.
North American Aviation
United Aircraft Company
Celanese Corporation
United States Steel
Syracuse University
U. S. Rubber Co.
White Pine Copper Co.
City of Holyoke, Mass.

A few prominent consulting engineers

Sargent & Lundy • Ebasco Services • Chas. T. Main • Day & Zimmerman • Rust Engineering Co. • Albert Kahn • Vern E. Alden • Gilbert Associates, Inc. • Sanderson & Porter • The Kuljian Co. • Ford, Bacon & Davis • Jackson & Moreland • Burns & McDonnell • Lockwood Greene • Stone & Webster • H. M. Wilson Co.

A survey of your plant by a consulting engineer could show ways of making surprising savings in your power costs.

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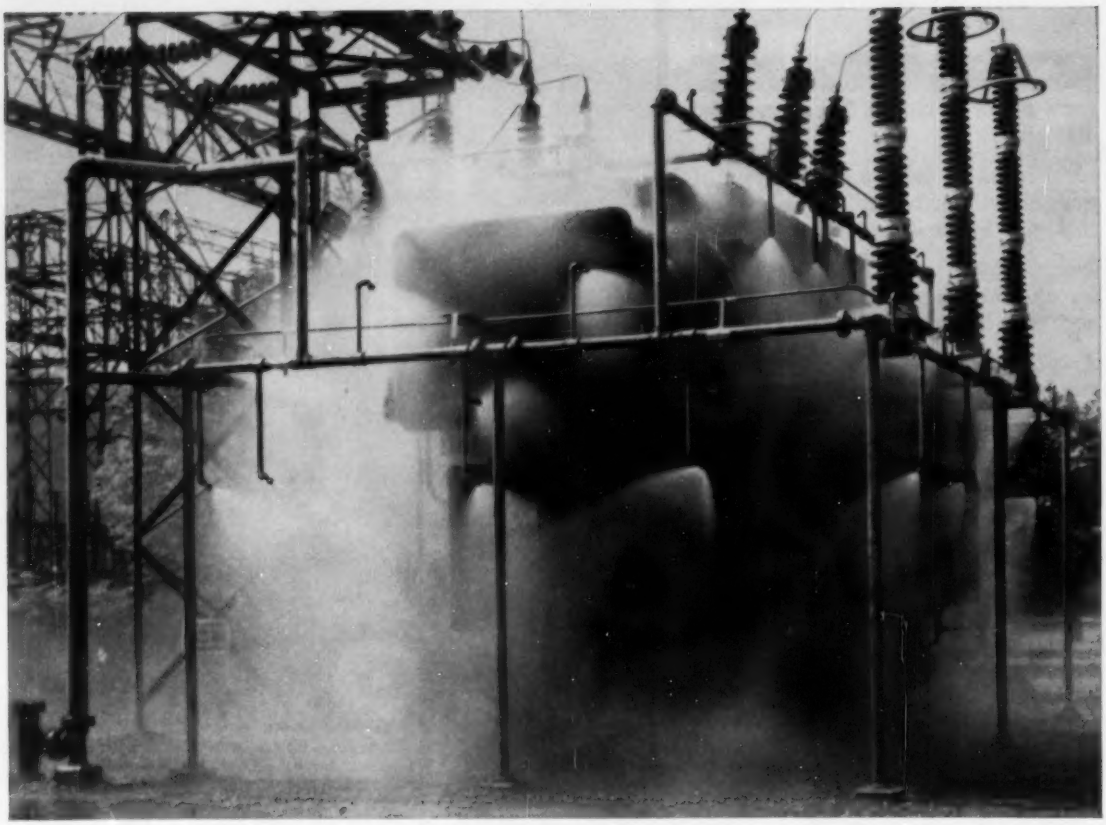
Boston, New York, Philadelphia, Buffalo, Washington, Pittsburgh, Cleveland, Detroit, Chicago, Cincinnati, Charlotte, New Orleans, Atlanta, St. Louis, Kansas City, St. Paul, Tulsa, Houston, Denver, Salt Lake City, Los Angeles, San Francisco, Portland, Seattle.



Blaw-Knox Automatic Fog System operating on transformer of the Duquesne Light Company, Pittsburgh, Pa.

ENGINEERED: *to provide positive protection against service interruption due to fire*

Here is what a BLAW-KNOX AUTOMATIC FOG SYSTEM provides:

- **fire-fighting action starts when rate of temperature rise is excessive**
- **alarms sound**
- **fire smothered promptly**
- **heat dissipated *rapidly* by cooling action**
- **adjacent equipment protected**
- **service interruption prevented**

A carefully engineered fire protection system, one designed to guard against your specific fire hazard, provides the most effective means of protection against destructive fire known. Such is a Blaw-Knox Automatic Fog System. It is engineered to each special hazard, with the most effective devices and the best smothering action.

Why not let a Blaw-Knox Fire Protection Engineer study your needs? He will submit a layout and a cost estimate. Write or wire us now. There is no obligation.

Send for a copy of our booklet, "Fire Can Destroy Your Business." You'll find it full of interesting facts.

Blaw-Knox fire protection systems carry approvals of all insurance underwriters

• Deluge Systems • Wet Pipe Systems • Dry Pipe Systems • Water Spray and Fog Systems • Rate-of-Rise Sprinkler Systems • Foam and Carbon Dioxide Extinguisher Systems.

BLAW-KNOX COMPANY

Power Piping and Sprinkler Division / Pittsburgh 33, Pennsylvania

take a simple bolt... for instance

—how much better can it be? Plenty. When it's made by Burndy, it's made of Durium, the corrosion-resistant silicon-bronze alloy; *cold-worked* for extra strength; the threads are *rolled* instead of cut, to *retain* the strength; the cold-worked heads are integral with shanks, with fillets that prevent cracks at junction of shank and head.

Burndy bolts – nuts – washers – *all* help to insure tight, strong, corrosion-free connections with *low* contact resistance.

Quick Delivery on all orders . . . anywhere in the U.S.A. . . . from large warehouse stocks.

For complete catalog and prices, call nearest Burndy representative listed in phone book, or write to Burndy headquarters.

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NORWALK, CONNECT. — TORONTO, CANADA • *Factories:* NEW YORK, CALIF., TORONTO • *Export:* PHILIPS EXPORT COMPANY

Now, *quality*

high-voltage cable at less cost:
with **new RoZone-RoSeal**

Superior moisture resistance compared to other types of nonmetallic sheaths: That's just one advantage of RoSeal, Rome Cable's new special thermoplastic sheath for shielded power cable rated up to 15 KV.

In its new RoSeal, Rome has perfected a sheathing material which better fulfills all requirements for a shielded power cable sheath, eliminates many disadvantages of other sheathing materials, *and* reduces cable cost.

In the case of RoZone-RoSeal cable, the new RoSeal sheath is applied over Rome's premium quality oil-base type insulation, RoZone. Thus, the new RoSeal sheath, combined with time-proven RoZone insulation, offers seven other advantages, in addition to its outstanding moisture resistance.

1. The coefficient of friction of RoSeal is considerably lower than other sheathing materials. This makes it much easier to pull in ducts or conduit.
2. RoSeal is easier to bend and install at subzero temperatures. Minimum recommended installation temperature is −40°C.
3. RoSeal has proved satisfactory for *both* underground and overhead use.
4. RoSeal is durable and long lasting —has a life expectancy at least equivalent to polychloroprene sheath.
5. RoSeal is flame resisting.
6. RoSeal provides a rugged mechanical barrier. Its tensile strength, hardness and other mechanical properties are designed for the job.
7. RoSeal is resistant to microorganism attack. Its resistance to weathering and soil conditions is also equal to that of polychloroprene sheaths.

Electrical tests made in the Rome laboratories show uniformly higher corona level and dielectric strength for RoSeal jacketed power cables.

RoSeal has particularly high resistance to oils and most chemicals, making it especially adaptable for installation in chemical plants, refineries, paper mills, steel mills and the like.

We invite you to prove for yourself the value of RoSeal. Write today for a sample of RoZone-insulated, RoSeal-sheathed power cable. You'll find it's everything we have stated here.

It Costs Less to Buy the Best

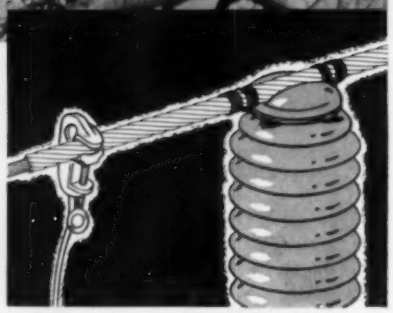
ROME CABLE
Corporation
ROME · NEW YORK
TORRANCE · CALIFORNIA

Reduce TREE TRIMMING

Reduce maintenance expense . . . improve customer good-will by protecting your conductor with Preformed Line Guards. Metal or plastic guards available . . . all are accurately formed to fit snugly without loosening—ever. Easy to install—no tools needed.

These exclusive guards assure positive protection against the abrasive rubbing of tree limbs, corners of buildings, poles and other damaging objects. Dangers of grounding are eliminated . . . insulation life prolonged indefinitely. Conductor maintenance is nil.

For longer care-free service—a greater safety factor, specify Preformed Line Guards.



LINE GUARDS or ARMOR RODS

Line guards, a development from ARMOR Rods are used, like ARMOR Rods, to protect against arcover, chafing and mechanical wear due to concentrated stresses.

• *For complete details of their exclusive advantages, write or telephone Cleveland: EXpress 1-3571.*

PREFORMED LINE PRODUCTS COMPANY

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DON'T baby these Hi-Voltage Switches!

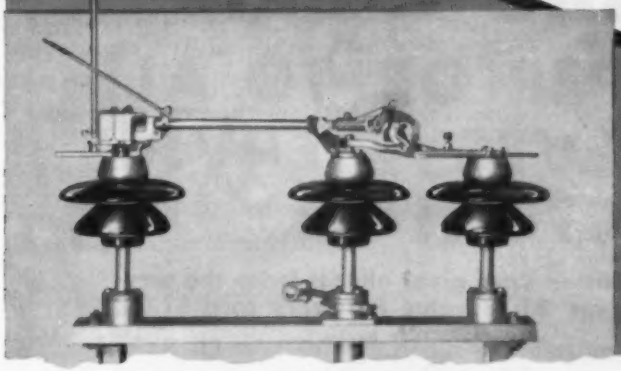
HI-VOLTAGE EQUIPMENT COMPANY

DON'T **LUBRICATE BEARINGS** because they are of such design and material to withstand the effects of weather. The application of grease or oil will only serve to collect atmospheric dust and hinder the easy operation of Hi-Voltage Switches.

DON'T **CLEAN THE CONTACTS** . . . they are silver overlays on both sides. No particular benefit will be gained by cleaning them . . . the oxides and sulfides of silver for all practical electrical purposes are as clean and conducting as silver itself.

DON'T **COAT WITH A CORROSION-PREVENTING AGENT.** Every part of these switches has been built from materials that completely withstand the attacks of the harmful elements in industrial atmospheres.

DON'T **"EXERCISE" THIS SWITCH.** Once the switch has been properly installed, you *do not* have to operate them several times a year just as a maintenance procedure.



"JUST INSTALL IT AND FORGET IT"

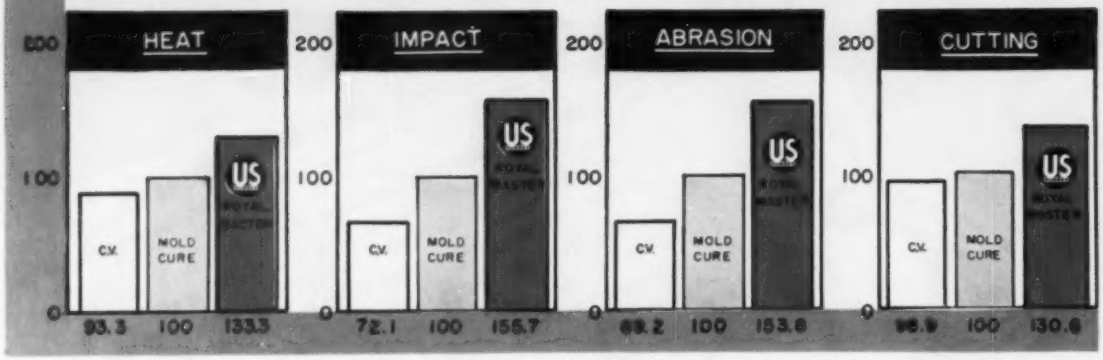
The "IN-OUT-UP" motion of Hi-Voltage Switches accounts for their unexcelled service record . . . provides the easiest possible operation and the maximum mechanical strength.

ONLY HI-VOLTAGE CAN MAKE THESE "DON'T" STATEMENTS!

HI-VOLTAGE EQUIPMENT COMPANY
DIVISION OF JOSLYN MFG. & SUPPLY CO.
4000 EAST 116th STREET • CLEVELAND 5, OHIO

STARTLING

Comparative performance of portable cords related to major life factors.



New U. S. ROYAL MASTER portable cord

PROVES SUPERIOR TO ALL OTHERS IN EVERY SERVICE FACTOR!

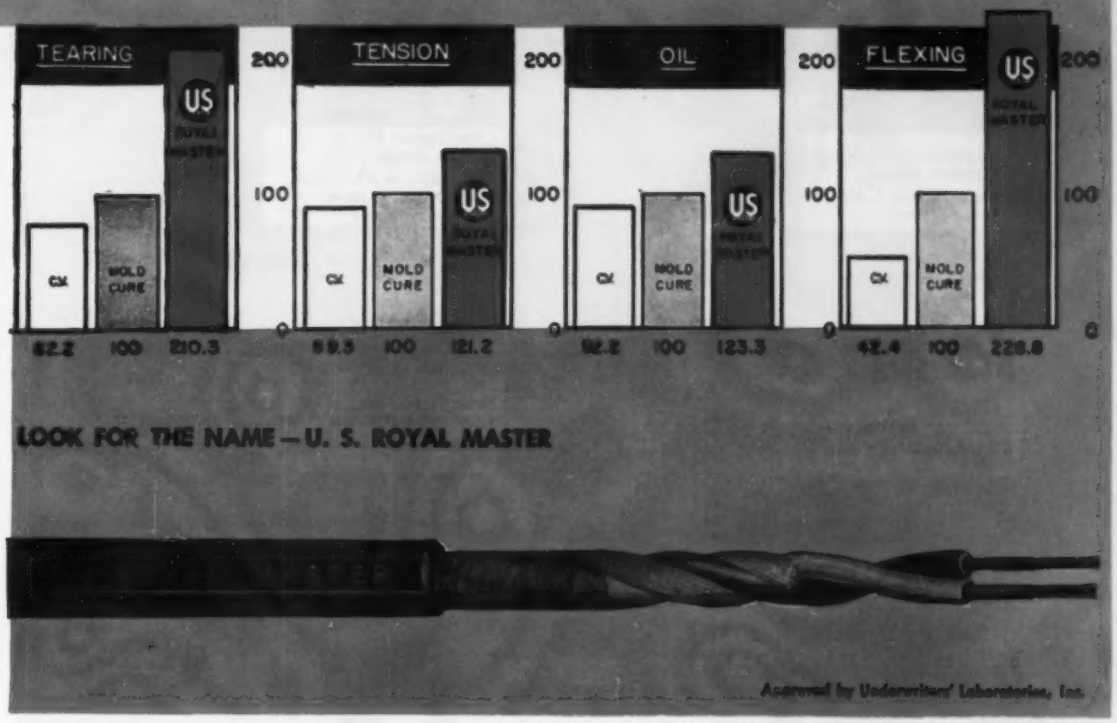
Newly developed U. S. Royal Master Cord gives almost twice the service of other molded cords – gives $1.88 value for every cord $1.00!

Life factor charts illustrate outstanding superiority of new U. S. Royal Master over the average of both the molded cords and the short-lived continuous vulcanized cords of other makes.

US RUBBER

UNITED STATES
ELECTRICAL WIRE & CABLE DEPARTMENT

EVIDENCE!



Cord construction completely reexamined. Over two years ago, U. S. Rubber engineers began a thorough reexamination of electrical cord design and construction. More than a thousand cords, including those of all major competitors as well as our own U. S. Royal Cord, were thoroughly and painstakingly analyzed. Over 10,000 tests were made to determine the principal causes of cord failure.

Every possible life factor was carefully and honestly appraised to find its relation to overall cord service.

With the findings at hand, "U. S." Engineers then drew upon their 64 years of experience in the manufacture of fine quality wire and cable to produce this exceptional new cord.

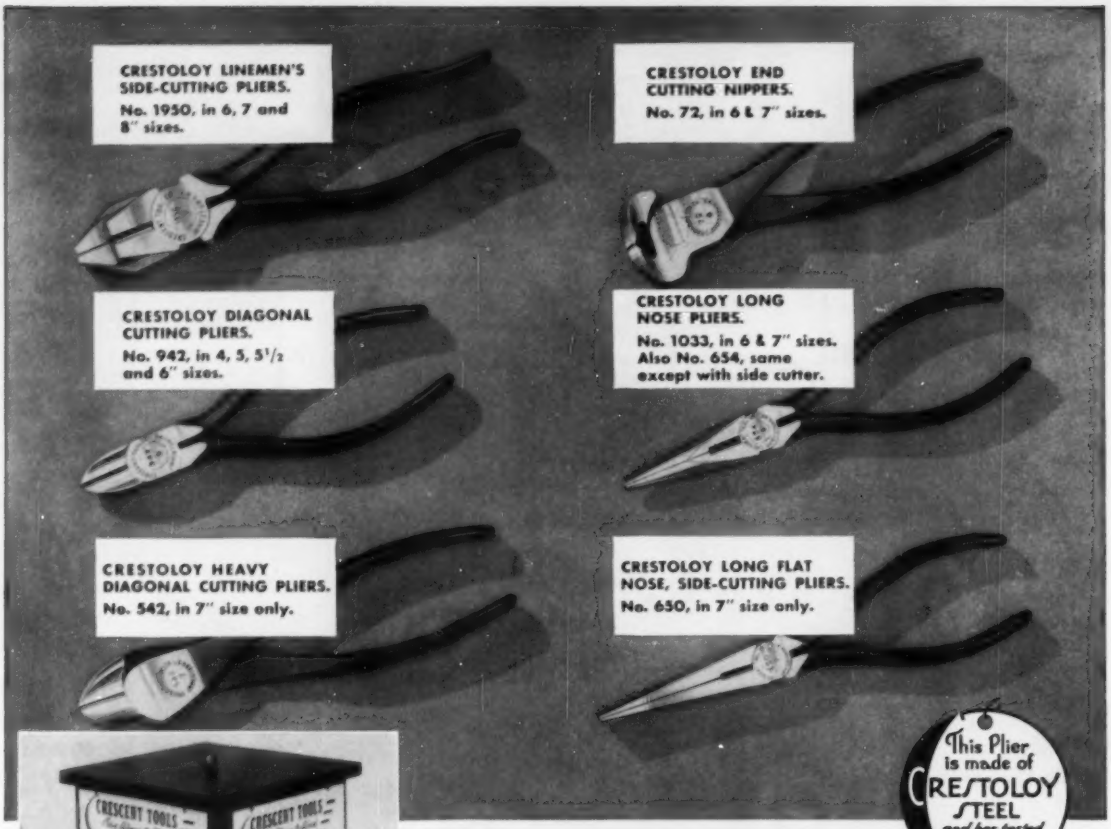
Every fault uncovered by the exhaustive two-year testing was tackled and solved.

Tested and proved. The new U. S. Royal Master was then tested against all competitive cords—installed in outside plants for final on-the-job corroboration.

U. S. Royal Master Cord proved itself to be unquestionably the finest cord you can buy! So superior, it gives almost double the service life of the average of competitive molded cords—actually gives you $1.88 in value for every cord dollar!

Prove for yourself the phenomenal superiority of U. S. Royal Master. Write to address below for FREE descriptive booklet illustrating the superiority of the U. S. Royal Master Cord. And get in touch with your "U. S." distributor today!

RUBBER COMPANY
ROCKEFELLER CENTER, NEW YORK 20, N. Y.


CRESTOLOY LINEMEN'S SIDE-CUTTING PLIERS.
No. 1950, in 6, 7 and 8" sizes.
CRESTOLOY END CUTTING NIPPERS.
No. 72, in 6 & 7" sizes.
CRESTOLOY DIAGONAL CUTTING PLIERS.
No. 942, in 4, 5, 5 1/2 and 6" sizes.
CRESTOLOY LONG NOSE PLIERS.
No. 1033, in 6 & 7" sizes. Also No. 654, same except with side cutter.
CRESTOLOY HEAVY DIAGONAL CUTTING PLIERS.
No. 542, in 7" size only.
CRESTOLOY LONG FLAT NOSE, SIDE-CUTTING PLIERS.
No. 650, in 7" size only.
This Plier is made of CRESTOLOY STEEL and has tested 100% satisfactorily

Your hardware dealer carries a wide selection of Crescent and Crestoloy Tools. You cannot buy finer tools at any price.

CRESTOLOY PLIERS

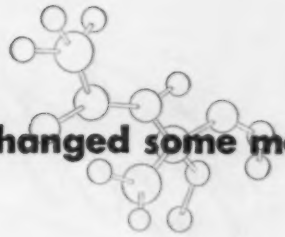
are individually tested!

Crestoloy Pliers take all the guesswork out of plier buying, because Crescent has taken all the guesswork out of plier making. Rigid specifications establish the material, design, workmanship, tests and inspection of these better tools. Strict adherence to these specifications is maintained by continuous tests and relentless inspection of the *individual* tools. Every plier carries the Crestoloy tag certifying that it has been individually tested.

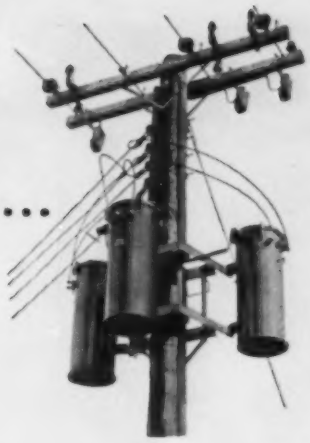
CRESCENT TOOLS
Give Wings to Work
®
Sign of the Artisan Symbol of Excellence

Crescent is our trade-mark, registered in the United States and abroad, for wrenches and other tools. Sold by leading distributors and retailers everywhere and made only by

CRESCENT TOOL COMPANY, JAMESTOWN, NEW YORK



Du Pont changed some molecules . . .



to produce the higher heat resistance of ALATHON®

polyethylene resin

From the Du Pont laboratories comes "Alathon" polyethylene resin with increased heat resistance for insulation and jacketing. This extra measure of protection for copper and aluminum conductors is in addition to other important properties, such as weatherability.

Jacketing of "Alathon" has outstanding dielectric strength. This material is lightweight and pliable; linemen find it easy to handle. Jacketing of "Alathon" provides real economy because it lasts for years without festooning or splitting. Another advantage is its low rate of water absorption.

For more property and application data on the family of Du Pont "Alathon" polyethylene resins, clip and mail the coupon below.

There is a difference in polyethylenes - specify ALATHON®

polyethylene resin

DU PONT

BETTER THINGS FOR BETTER LIVING . . . THROUGH CHEMISTRY

E. I. du Pont de Nemours & Co. (Inc.)
Polychemicals Department
Room 353, Du Pont Building, Wilmington 98, Delaware

Please send me complete information on Du Pont "Alathon" polyethylene resins. I am interested in evaluating these materials for

Name _____ *Position* _____

Firm Name _____

Street Address _____

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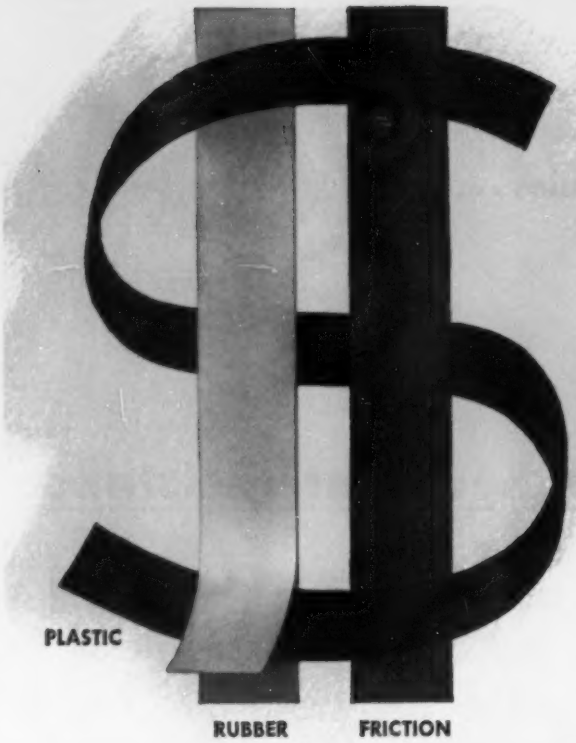
Type of Business _____



Extra DOLLAR VALUE IN GOLD SEAL TAPES

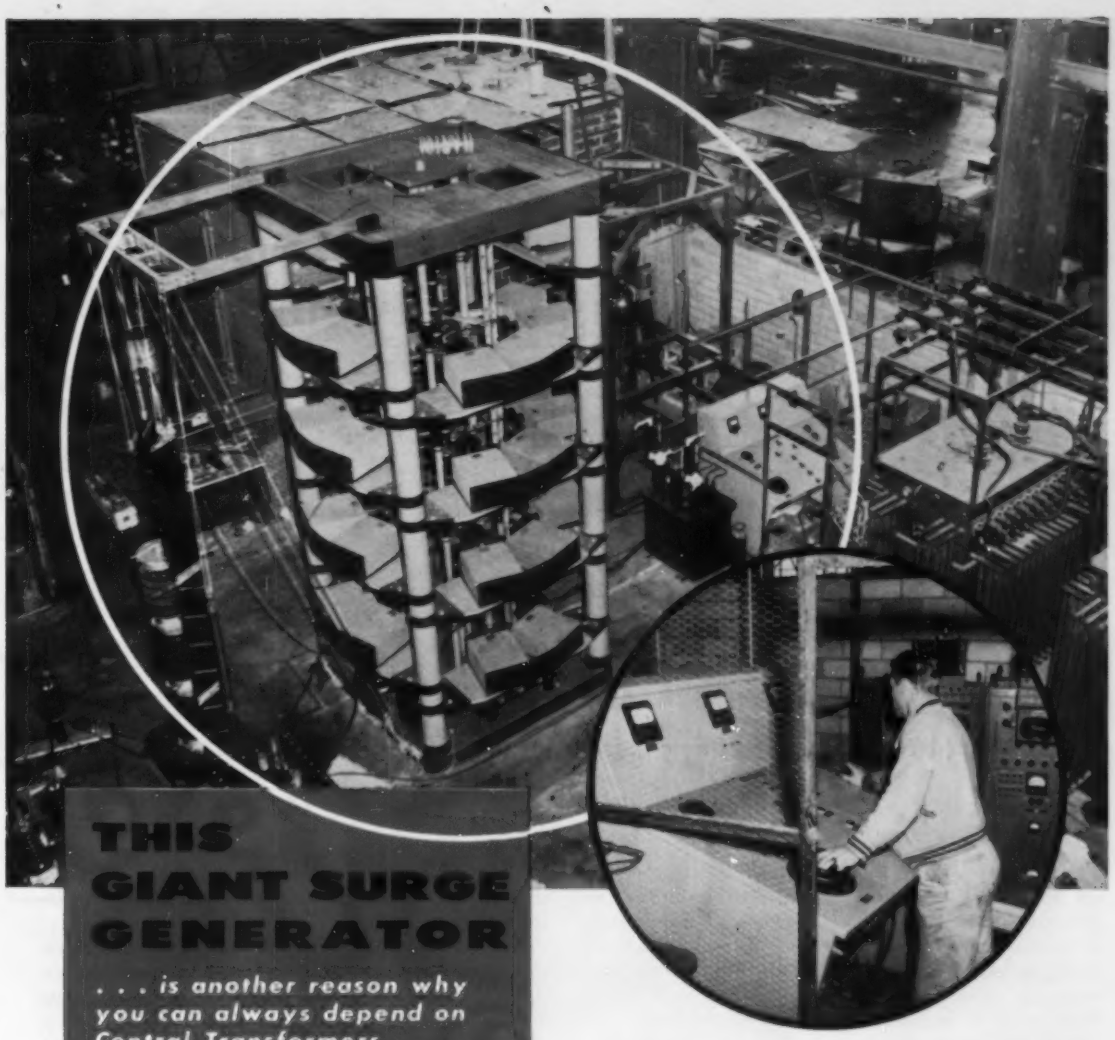
Gold Seal **PLASTIC** electrical tape, for example, gives you more "coverage" per roll. A few neat wraps and the job's finished — gives all needed dielectric on most jobs. Single 60 ft. rolls, cellophane protected, are packed in round metal cans. "Tape-saver" 20 ft. rolls, sized to meet average job needs and "swing" easy in tight places, are packed in 10-roll Handy Pack containers. Sample free on request. Jenkins Bros., Rubber Division, 100 Park Avenue, New York 17.

JENKINS

Gold Seal Tape

FRICTION • RUBBER • PLASTIC

Also Diamond Seal Friction and Rubber Tapes made to ASTM specifications. Products of Jenkins Bros. — makers of famous Jenkins valves.



THIS GIANT SURGE GENERATOR

. . . is another reason why you can always depend on Central Transformers

Every step in the manufacture of Central Transformers is carefully guarded to insure highest quality, finest performance. Specialists, responsible only to management, minutely inspect and test each operation. And the finest testing equipment is here to guarantee perfection.

For example, in the power test panel is this 1,600,000 volt surge generator equipped to impulse test transformers. It is a symbol of the precision and performance built into every Central Transformer. Hundreds of installations throughout the nation prove that Central Transformers meet the most rigid standards. We welcome your inquiries.

A type for every need . . . from the smallest to the largest

CTC NEMA **Central** TRANSFORMER CORP.

PINE BLUFF, ARKANSAS

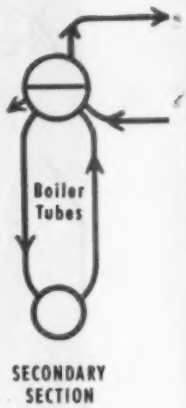
Sales Offices in principal cities.

DESIGNERS AND MANUFACTURERS OF TRANSFORMERS ONLY

dual circulation

provide high-purity steam

- with high feedwater makeup
- with high silica content feedwater
- at pressures above 600 psi



Cost-saving advantages of the exclusive FW dual circulation system now thoroughly proved by over 6 years of successful operation

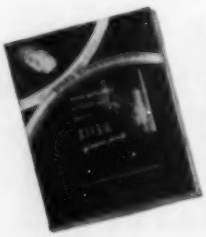
THE DUAL CIRCULATION STEAM GENERATOR was developed by Foster Wheeler to provide a practical means of reducing carryover of silica and dissolved solids from 100% makeup feedwater. At pressures over 600 psi, this carryover often causes costly turbine outages. With today's trend to higher pressures and temperatures, and larger sized units, carryover problems are sharply accentuated and the dual circulation principle offers still greater advantages.

As shown in the diagram above, the Dual Circulation Steam Generator utilizes two separate heat-absorbing sections, each with its own independent natural circulating system. The primary section, comprising principally the furnace walls, is blown down at a high rate, providing the feed to the secondary section. Steam from the secondary system is returned to the primary, where it is condensed in whole or in part by the incoming feedwater. Hence, virtually all of the steam delivered to the turbine is generated in the low-concentration primary section, thus sharply reducing silica carryover and total dissolved solids.

Predicted data on the first FW Dual Circulation Steam Generators have been fully confirmed by more than six years of operation with five 300,000 lb/hr, 1350 psi units having 100% makeup. Average silica carryover is only .004 ppm, compared to .08 ppm expected for a boiler of conventional circulation. Carryover of total dissolved solids is .007 ppm, compared to .56 ppm expected for a conventional unit.

Additional benefits include reduction of tube damage due to low concentration in primary section; reduced final blowdown with substantial saving in blowdown heat recovery equipment; and reduced cost of the makeup treating plant.

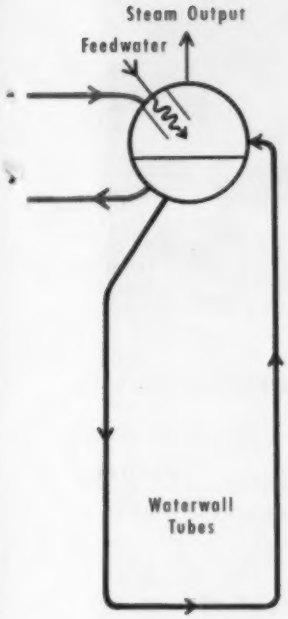
Wherever *high purity steam* is required, in central station or industrial service, FW Dual Circulation Steam Generators offer important savings in operating and maintenance cost.



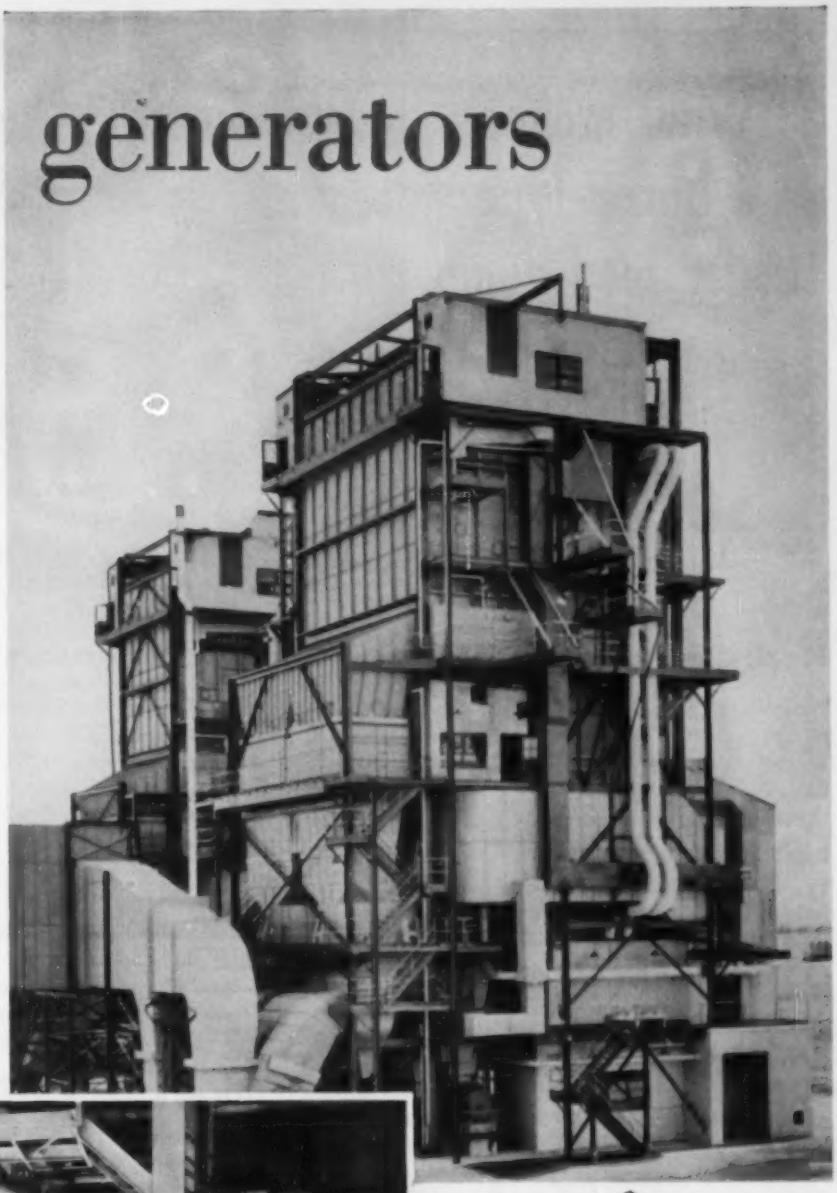
FOR COMPLETE INFORMATION on FW Dual Circulation Steam Generators, send for your free copy of 16-page Bulletin B-50-11. *Foster Wheeler Corporation, 165 Broadway, New York 6, N. Y.*

FOSTER WHEELER

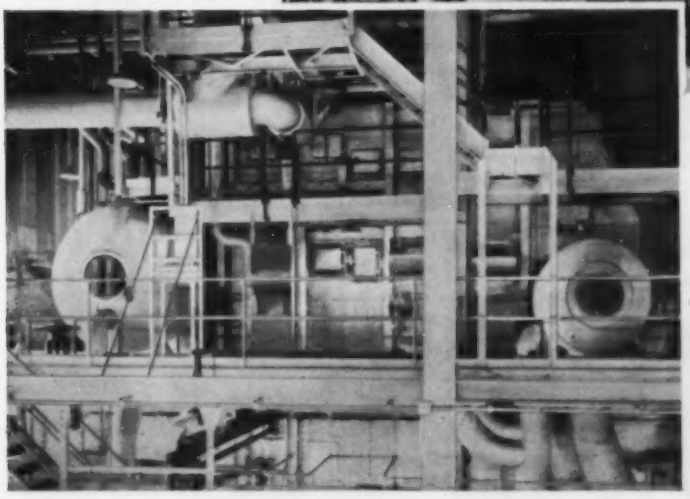
steam generators



Simplified flow diagram of typical 3-drum Dual Circulation unit. Blowdown from primary feeds continuously into secondary section. Final blowdown is from secondary drum.

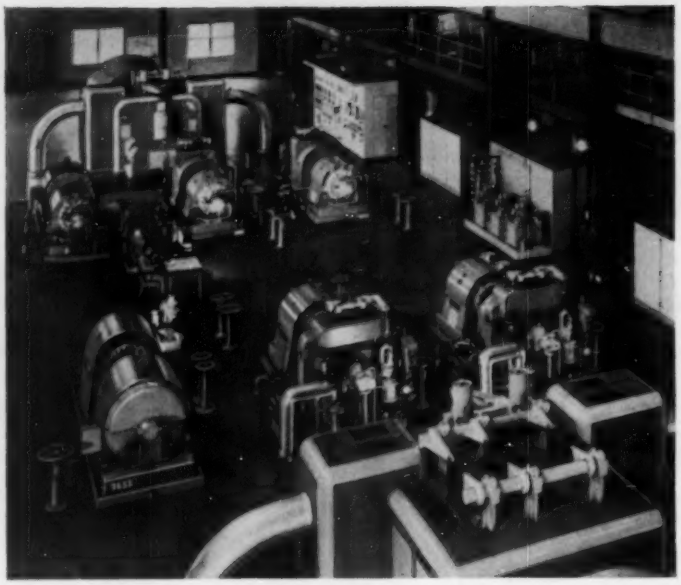


KANSAS GAS AND ELECTRIC CO. recently installed these two FW Dual Circulation units at the Murray Gill Steam Electric Station. One has a capacity of 425,000 lb/hr and the other, 625,000 lb/hr —both operating at 1350 psi, 955F. Consulting Engineers were Ebasco Services, Inc.



A LARGE MID-WESTERN REFINER has installed five FW Dual Circulation Steam Generators, each unit designed for 300,000 lb/hr at 1350 psi, 900F, with 100% feedwater makeup. Photo shows upper drums of one of the five 3-drum units. Consulting Engineers were Stone and Webster Engineering Corp.

What makes a barrel-type boiler feed pump *stay in service?*



Here are some of the design features that assure dependability

Today's modern multi-stage centrifugal pumps for boiler feed service are the result of years of research and design. To provide efficient service *plus* dependability, De Laval has incorporated these important features in its barrel-type pump.

Double Volute Diaphragms

Double volute diaphragms provide for radial hydraulic balance and assure a continuous rising head characteristic from the design point to shut-off. *RESULT—Higher efficiencies are maintained over a wider range of operation than are generally obtained with other forms of velocity pressure conversion.*

Individual Diaphragm Bolting

Elimination of rabbet fits and gaskets permits straight metal-to-metal contact of adjacent lapped faces of the diaphragms which are individually bolted together to maintain tight joints and ease of assembly. *RESULT—Positive assurance against inner case leakage, complete elimination of misalignment causes and a minimum of distortion from sudden temperature changes.*

Positive Sealing Between Suction and Discharge Chamber

Inner assembly is held at the inner high pressure joint at the suction end of the barrel, against a flexitallic gasket, with through bolts. The joint between the suction and discharge chambers is made tight during assembly—remains tight whether pump is operating or idle. *RESULT—No possibility of leakage or gasket loosening due to changes of force on the inner joint.*

Bare Shaft

Bare shaft construction with split ring-shrink fit method of impeller mounting permits a scalloped shaft design and eliminates the need for spacer sleeves between impellers. *RESULT—Better hydraulic conditions at the eye of the impeller and elimination of spacer sleeves—the greatest cause of shaft warpage.*

Wearing Rings

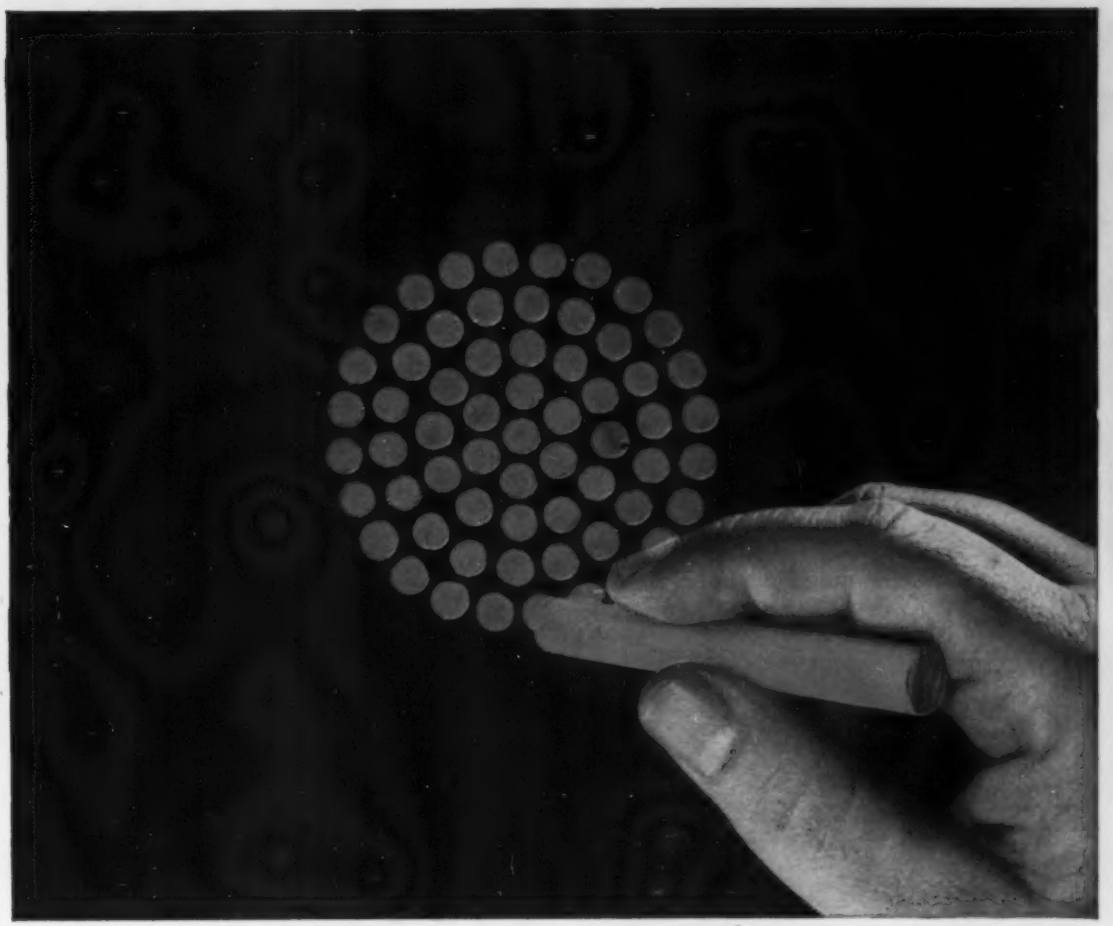
Diaphragms and impellers have renewable wearing rings. Impeller rings are threaded on the impeller hubs against rotation, and diaphragm rings are held by a breech lock fit in the diaphragms. *RESULT—Construction permits renewal of original clearances without major part renewal or modification. Labyrinth type diaphragm ring results in minimum leakage over a longer period of time than with close clearance flat rings.*

IMO Oil Pump

A De Laval IMO pump designed for high speed operation is direct-connected to the outboard end of the barrel pump shaft, and is sized to lubricate both pump and driver bearings. *RESULT—Quiet, pulsation-free, positive displacement IMO pumps, assures positive lubrication and eliminates the need of extra shaft length and mechanical complications required by gear drive lube oil pumps.*

BULLETIN CONTAINS HELPFUL DATA

This De Laval bulletin on the barrel-type boiler feed pump covers all major design points . . . has cross-section cut-away illustration for easy reference. Write on your business letterhead for your copy of Bulletin 1506 to De Laval Steam Turbine Company, 861 Nottingham Way, Trenton 2, New Jersey.



THE ADVANTAGES OF

CABLE TYPE

BUS CONDUCTORS

Cable and Strand are efficient bus conductors in electric power switching structures wherever clearances permit and spans are too long for rigid types. They are the preferred flexible conductor for delivering heavy currents, generally at the lower voltages, to electric furnaces or to any concentrated industrial electrical load.

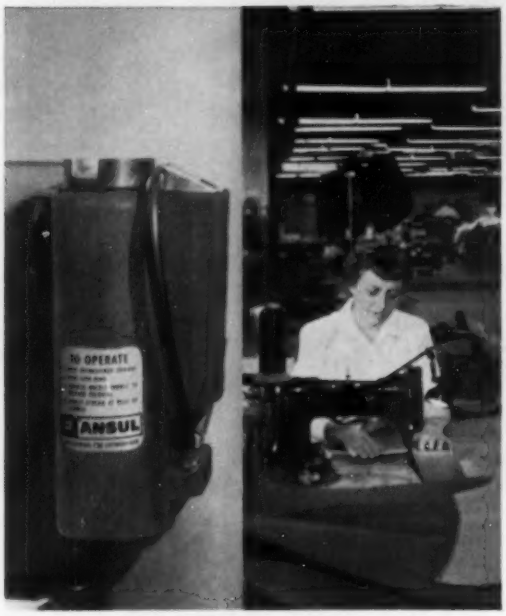
Proper stranding of the conductor wires is necessary to obtain flexibility, strength and the smallest *practical* voltage drop.

There is a complete line of ANACONDA Copper Bus Conductor designs for every type of installation and power requirement. Write today for your copy of "ANACONDA Copper Bus Conductors" containing illustrations and detailed technical information concerning designs and arrangements for bus conductors. *The American Brass Company, Waterbury 20, Connecticut. In Canada: Anaconda American Brass Ltd., New Toronto, Ontario.* 53128 Rev.

carry the load with ANACONDA® Bus Conductors

New multi-purpose 10 lb. Ansul Extinguisher

can simplify your fire protection problem



Easy-to-operate Ansul 10-pounder gives fast, effective results. Light weight makes it easy for women to use.

The 10-pounder stands up under rugged road use. Built to give dependable service after extreme exposure. Listed by Underwriters' Laboratories.

New rugged unit gives you high fire killing rating, light weight, modern design

The new Ansul 10-pounder is *designed* and *constructed* for all-around plant use—wherever dry chemical protection of this capacity is called for. It is ideally suited for truck protection, other outdoor hazards and indoor use. This multi-purpose advantage means that you have fewer models of extinguishers to service and a less complicated training program to maintain.

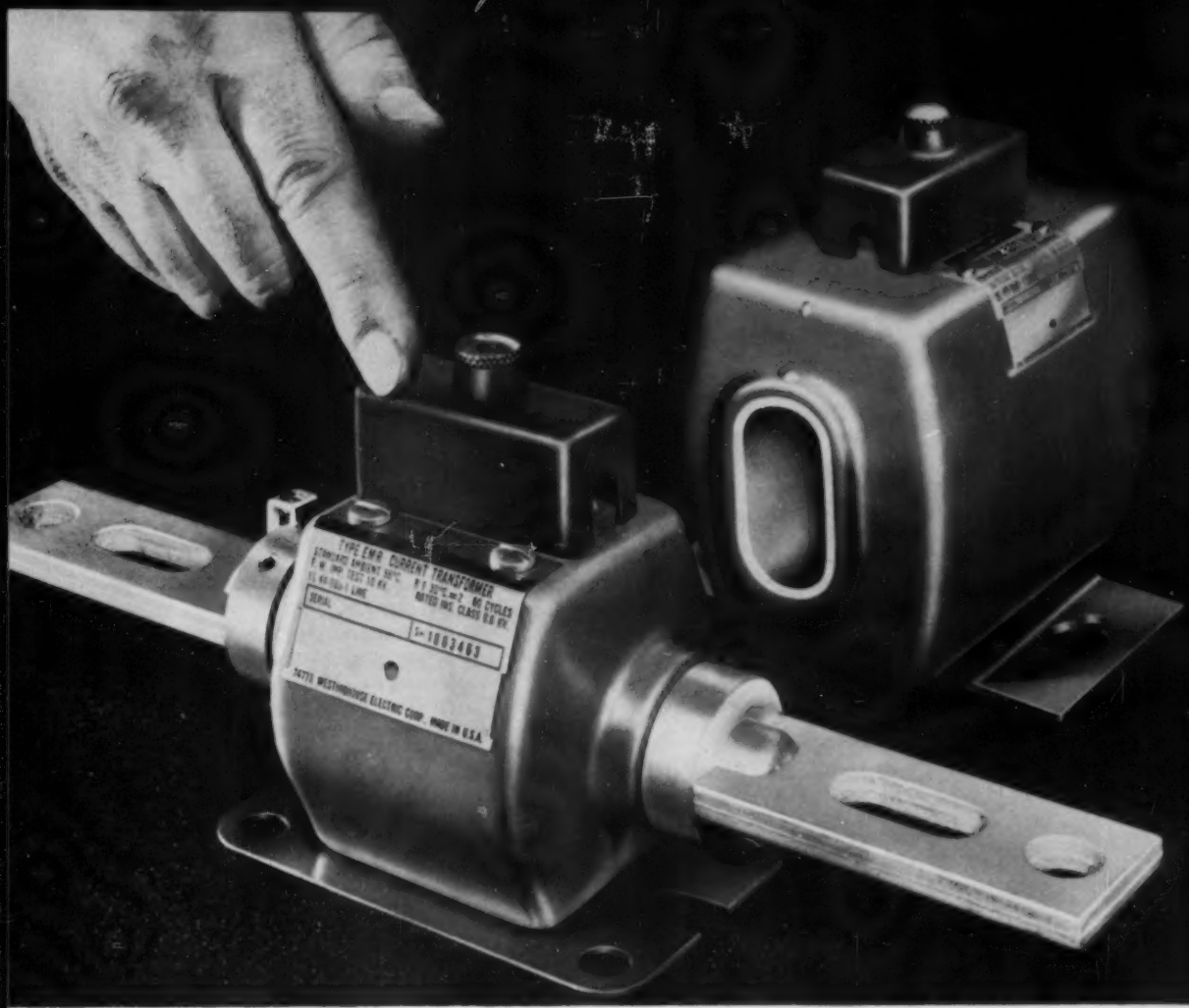
The high fire killing rating (B1, C1) of this unit gives you *effective* protection the *instant* it's needed. Another advantage of the Ansul 10-pounder is its light weight. This feature is important where women are called upon to lift and operate the unit. This extinguisher is also modern in appearance. It was styled by Raymond Loewy to be *seen* in any location—in the office, laboratory, plant, or on a truck.

Have the Ansul Man review your class B and C hazards, those involving flammable liquids, gases, and electricity. He will show you how the Ansul 10-pounder can make your fire protection program easier to administer, more economical to maintain.

Call the Ansul Man!

Get in touch with your local Ansul man through the "yellow pages" or write ANSUL CHEMICAL COMPANY, Fire Equipment Division, Dept. F-155, Marinette, Wisconsin. *Write Ansul for your copy of new Fire Equipment Catalog.*

ANSUL



NEW TYPE EMR (LEFT) AND TYPE EMO (RIGHT) CURRENT TRANSFORMERS

Polyester molded for lighter weight, longer life

Outstanding is the word for the new Westinghouse Types EMR and EMO indoor-outdoor current transformers for 600-volt service. They are lighter, smaller, more durable and more pleasing to the eye than any comparable units.

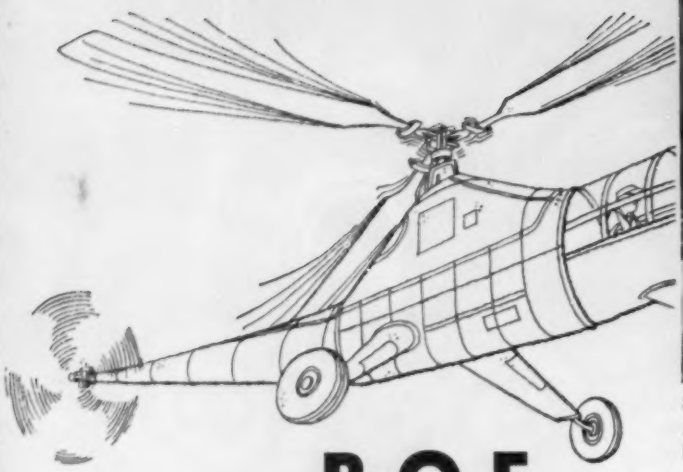
Both are molded of a polyester elastomer insulating material that has excellent thermal and dielectric stability—remains physically flexible at high or low temperatures. Both use exclusive Hipersil® cores—a major factor in their small size and superior performance. And both have rating factors of 2.0. The EMR and EMO (200/5 A.) have 0.3 accuracy classification at B-0.1 and B-0.2. The EMO (400-600-800 A.) maintains this accuracy also at B-0.5.

The EMR has a round primary opening and is available with or without a removable round or flat terminal bar. The EMO features an obround opening for use with multi-cable primaries. They may be installed in any position—on virtually any type of mounting.

For full details, call your Westinghouse representative, or write for B-6520, Westinghouse Electric Corporation, 3 Gateway Center, P. O. Box 868, Pittsburgh 30, Pennsylvania. J-70749

YOU CAN BE SURE...IF IT'S Westinghouse

Capsule Case History:



370,000 KW
Are Produced
by coupling 15 boilers to 16 turbo-generators in the largest private industrial power plant in the country. The interconnection of steam, feedwater and fuel supply lines as well as electrical circuits provides maximum flexibility in control, operation and maintenance.

The client is given complete security by the availability of a utility company tie-in to provide power for rapid start-up at the plant. Every KE designed plant has look-ahead features built in.

The new KE power brochure (No. 104) is just out. Your copy will be mailed upon request.

B.O.F.

***B**uilt-in **O**perational **F**lexibility (outstanding characteristic of the helicopter) is an "extra" found in every plant designed and built by Kaiser Engineers. Not hidebound by tradition, the fresh approach of the KE team of specialists assures you that your next plant will feature efficient and flexible operation at low cost.*

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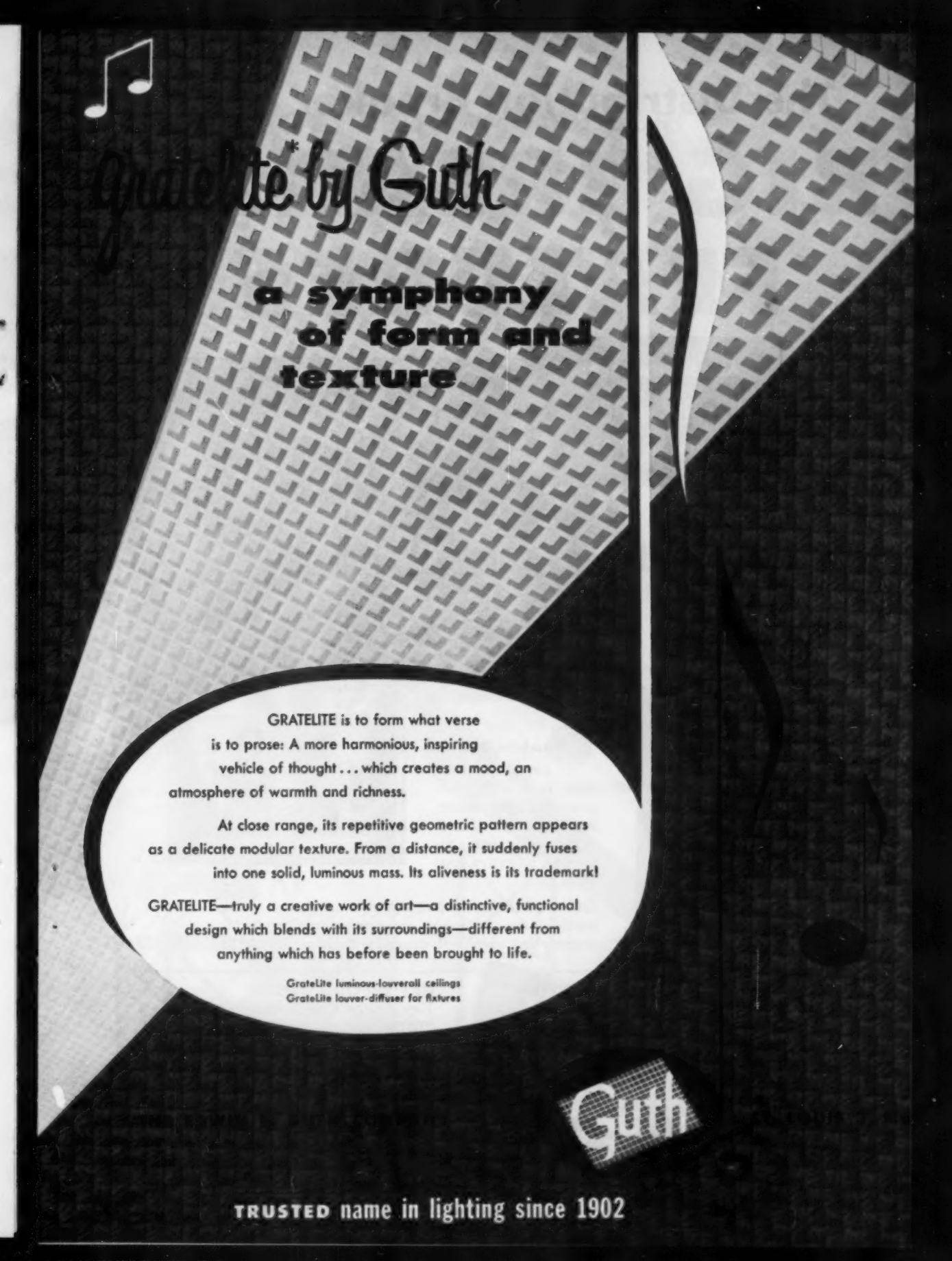

te* by Guth
a symphony of form and texture
GRATELITE is to form what verse is to prose: A more harmonious, inspiring vehicle of thought . . . which creates a mood, an atmosphere of warmth and richness.
At close range, its repetitive geometric pattern appears as a delicate modular texture. From a distance, it suddenly fuses into one solid, luminous mass. Its aliveness is its trademark!
GRATELITE—truly a creative work of art—a distinctive, functional design which blends with its surroundings—different from anything which has before been brought to life.
GrateLite luminous-louverall ceilings
GrateLite louver-diffuser for fixtures
Guth
TRUSTED name in lighting since 1902

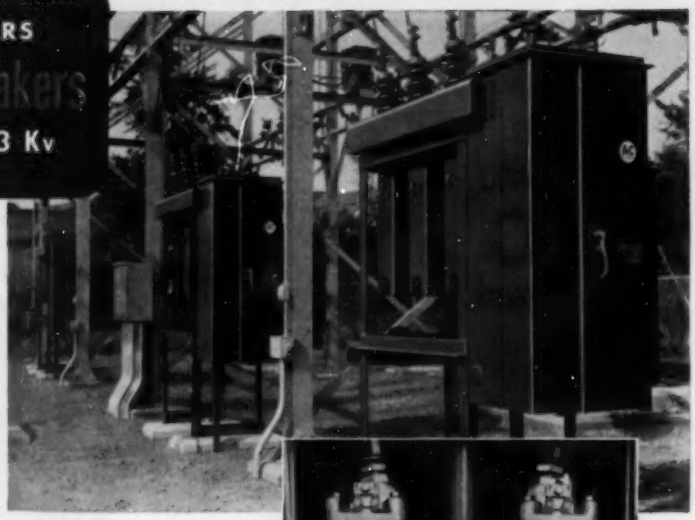
The Distribution Breaker With

BIG BREAKER FEATURES

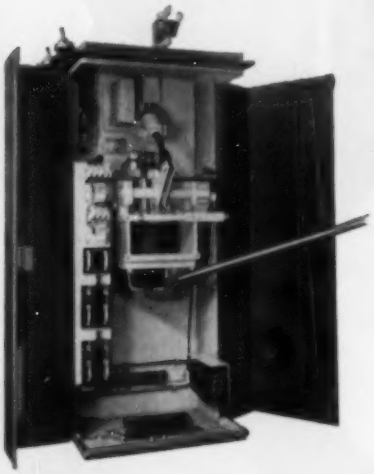
ALLIS-CHALMERS

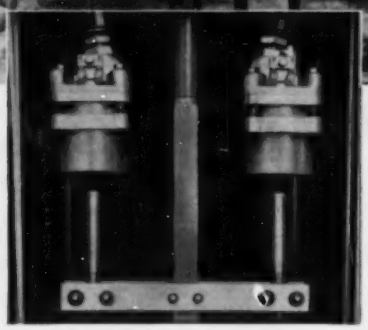
OZ Circuit Breakers

for service up to 23 Kv



Tank per phase construction (as used in large breakers) completely isolates phases and eliminates internal phase-to-phase flashover.





Double break per phase principle used with time-proved *Ruptor* interrupting devices. Self wiping, self aligning tulip and bayonet contacts used.

Other quality features include: fabricated wiring duct to simplify access to bushing transformer leads; non-buckling, non-warping tank liners; both external and internal position indicators.

Roomy cabinet Side hinging of L-shaped doors allows access to operator from three sides. Relays, when specified, are in separate cabinet.

GET INFORMATION

New 8-page descriptive bulletin No. 71B7946 now available. Call your nearby A-C office or write Allis-Chalmers, Milwaukee 1, Wisconsin.

Ruptor is an Allis-Chalmers trademark.

ALLIS-CHALMERS

A-4567

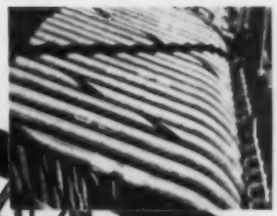
THEY'RE FROM MISSOURI

When Missouri Public Service Company needed a power plant constructed, they compared the performance records and experience of the companies bidding for the job.

They had to be shown; they chose Pritchard.

From the very first day, they started appreciating the close cooperation all the way down the line between Pritchard's staff and their own. This mutual respect and understanding made it possible for the job to get done right.

Pritchard has the ability and experience to handle the complexities of design, engineering and construction of your power plant. Let Pritchard show *you* the way to a profitable installation.



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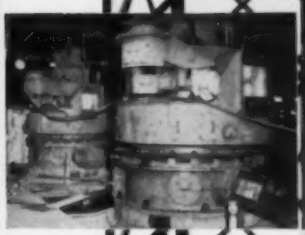
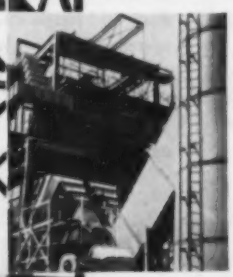
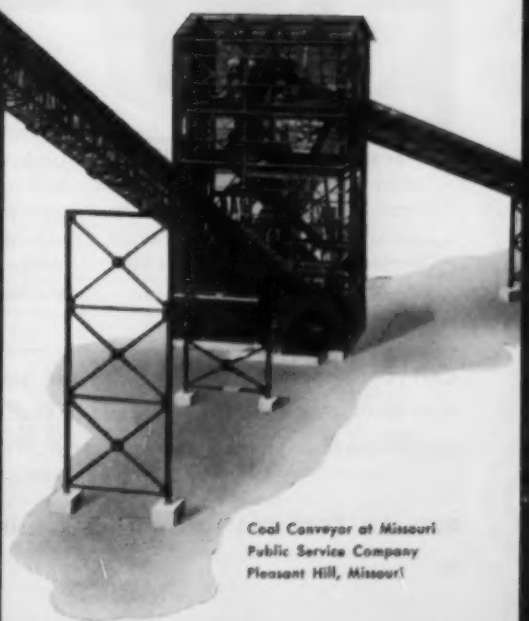


Coal Pulverizers

Induced Draft Fan

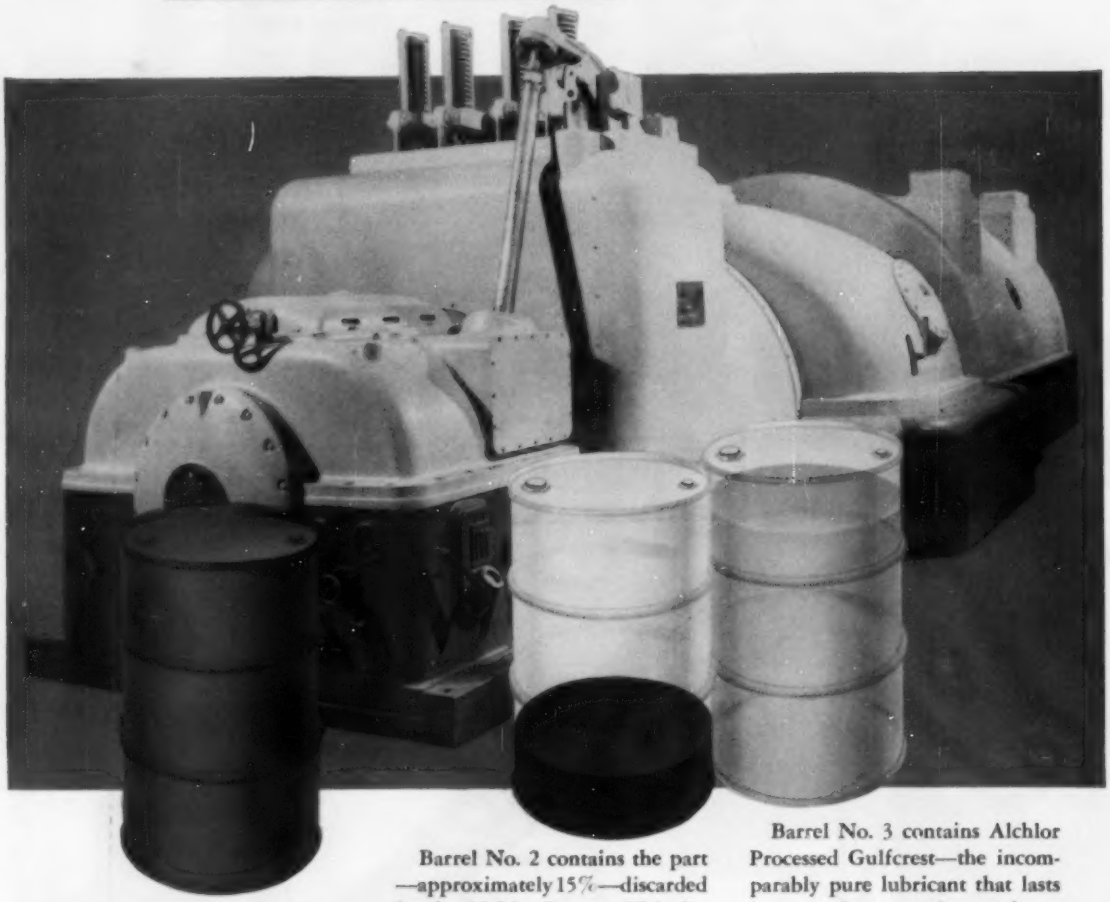


Exterior View of Boiler



Coal Conveyor at Missouri Public Service Company Pleasant Hill, Missouri

GULFCREST *is the only turbine oil that is super refined for superior performance by the ALCHLOR PROCESS*



Barrel No. 1 contains a highly refined oil that will become Gulfcrest. It has gone through the usual steps used in refining other turbine oils—but has not yet been Alchlor Processed.

Barrel No. 2 contains the part —approximately 15%—discarded by the Alchlor Process. This discarded portion contains unstable hydrocarbons which, if allowed to remain in a turbine oil, are likely to oxidize, increase neutralization number, form sludge, emulsifiers, and harmful acids.

Barrel No. 3 contains Alchlor Processed Gulfcrest—the incomparably pure lubricant that lasts longer, gives superior performance and helps keep your turbine systems clean indefinitely. To make Gulfcrest even finer, special inhibitors are added to give it still greater stability and protect against corrosion and foam.

Call your nearest Gulf office today and have a Gulf Sales Engineer recommend the proper grade of Gulfcrest Oil to meet the specific requirements of your turbines.

GULF

GULF OIL CORPORATION • GULF REFINING COMPANY • 1822 Gulf Building, Pittsburgh 30, Pa.

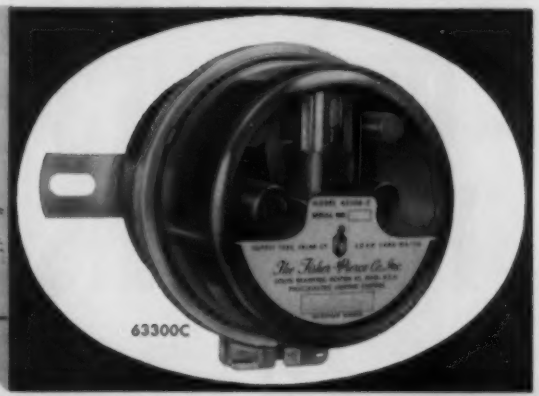
FISHER-PIERCE
PHOTOELECTRIC CONTROLS

for every lighting system requirement

The extreme versatility and quality of Fisher-Pierce photoelectric lighting controls is evidenced by their widespread use over the past eight years, in controlling hundreds of street lighting systems . . . aircraft obstruction and beacon lights . . . outdoor signs and store window lights . . . parking, loading and storage area lights . . . poultry house and roadside telephone illumination, etc. All Fisher-Pierce controls employ a basic circuit whose dependability, ruggedness and trouble-free performance have been proven in use.

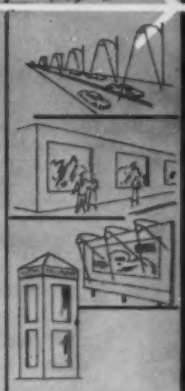
SERIES 63300C CONTROLS

Rugged, easily installed, accessible units for switching up to 3000 watts of lighting load. For operation at 105-130 or 210-250 V, 50-60 cycles. Standard models come with SPST, SPDT, or DPST power contactors. Special models are available with a switching capacity of 6000 watts. The electronic chassis is enclosed in a weatherproof watt-hour meter case assembly which plugs into a standard meter socket. The new 63300C design represents the results of eight years' extensive, specialized experience in the field.



SERIES 64400 CONTROLS

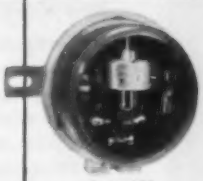
Small, compact, low cost units for switching 1000 watts of incandescent, mercury or sodium vapor lamps at 120 V, 50-60 cycles. Designed for use as an integral part of various manufacturers' luminaires, as well as for ballast, pole top, cross arm, standard and other mountings. Low initial cost and low maintenance make the use of one Series 64400 control per lamp economically practical for new street lighting installations and isolated locations.



THE ***nitelighter***

. . . for automatic control of home lights

An inexpensive, compact, automatic control made especially for domestic use. Operates on 110 volts AC, switches up to 300 watts. Plug lamp to be controlled into NITELIGHTER plug, face "eye" toward window; living room, hall, garage lights, etc. go on at dusk, off at dawn automatically and without attention. You'll never come home to darkness. Protects the home when you're away. Get it at your dealer, or if he cannot supply you, send a check or money order for $15.95. A NITELIGHTER will be sent postpaid and insured.


Series 100

MULTIPLE RELAYS FOR SWITCHING LOW VOLTAGE OUTDOOR LIGHTING CIRCUITS

Fisher-Pierce multiple relays incorporate a maintenance-free mercury plunger relay conservatively rated to switch 30 amps. at 110-115 volts AC. Series 100 relay is housed in a standard meter case and is available with or without line and coil protective equipment. The low cost Series 200 (not shown) is housed in a weatherproof cast aluminum case. Both series are designed for outdoor use as pilot wire control or for cascading street lighting circuits. Available with normally open or normally closed relays.

Complete Specifications and Data Available on Request

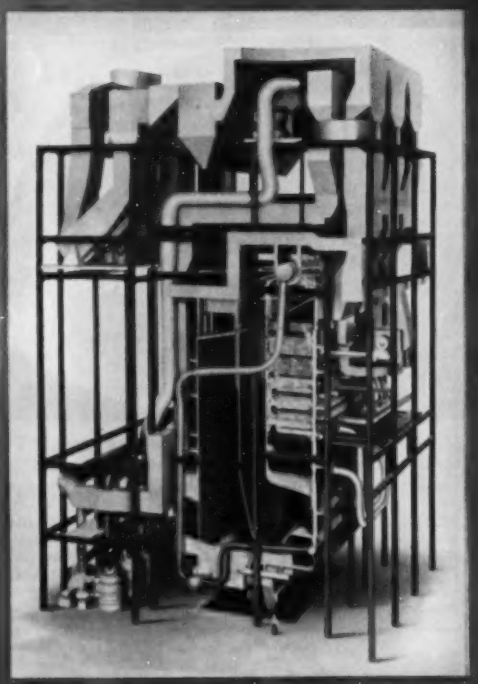
THE FISHER-PIERCE COMPANY, INC.

82 Pearl Street, So. Braintree, Boston 85, Mass.

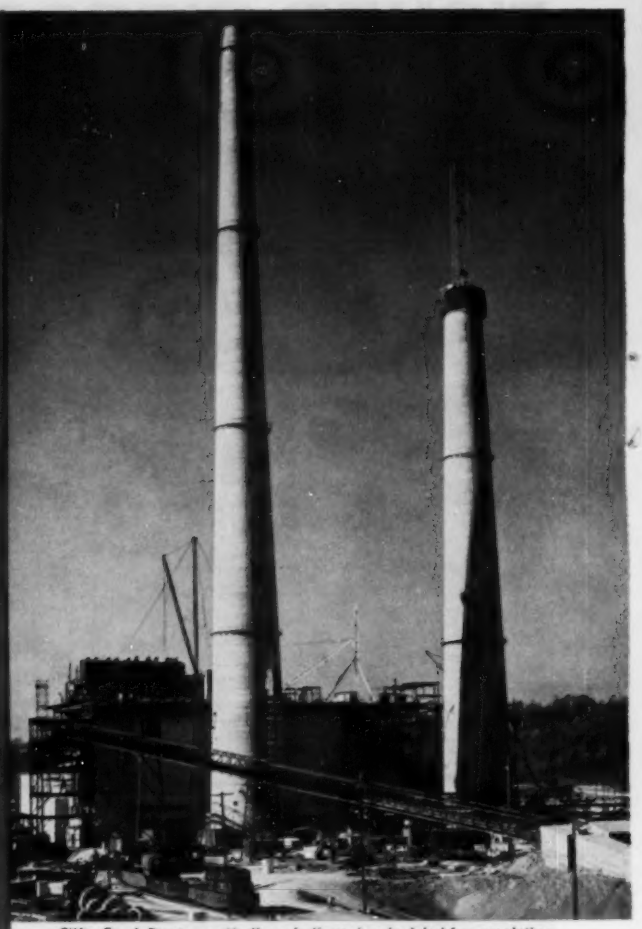
EXPORT: PHILLIPS EXPORT CORP. DIVISION OF NORTH AMERICAN PHILLIPS 100 E. 42ND STREET NEW YORK 17, N. Y.

IN CANADA: NORTHERN ELECTRIC CO., Ltd.

11 B&W Boilers help OVEC supply 15 BILLION KWHRS OF POWER FOR ATOMS



Eleven B&W Boilers of the type shown here will generate steam at the two new plants which will supply all electricity required for the great atomic production center known as the Portsmouth Area Project. It is the largest and perhaps most significant single undertaking in the history of the electric utility industry.

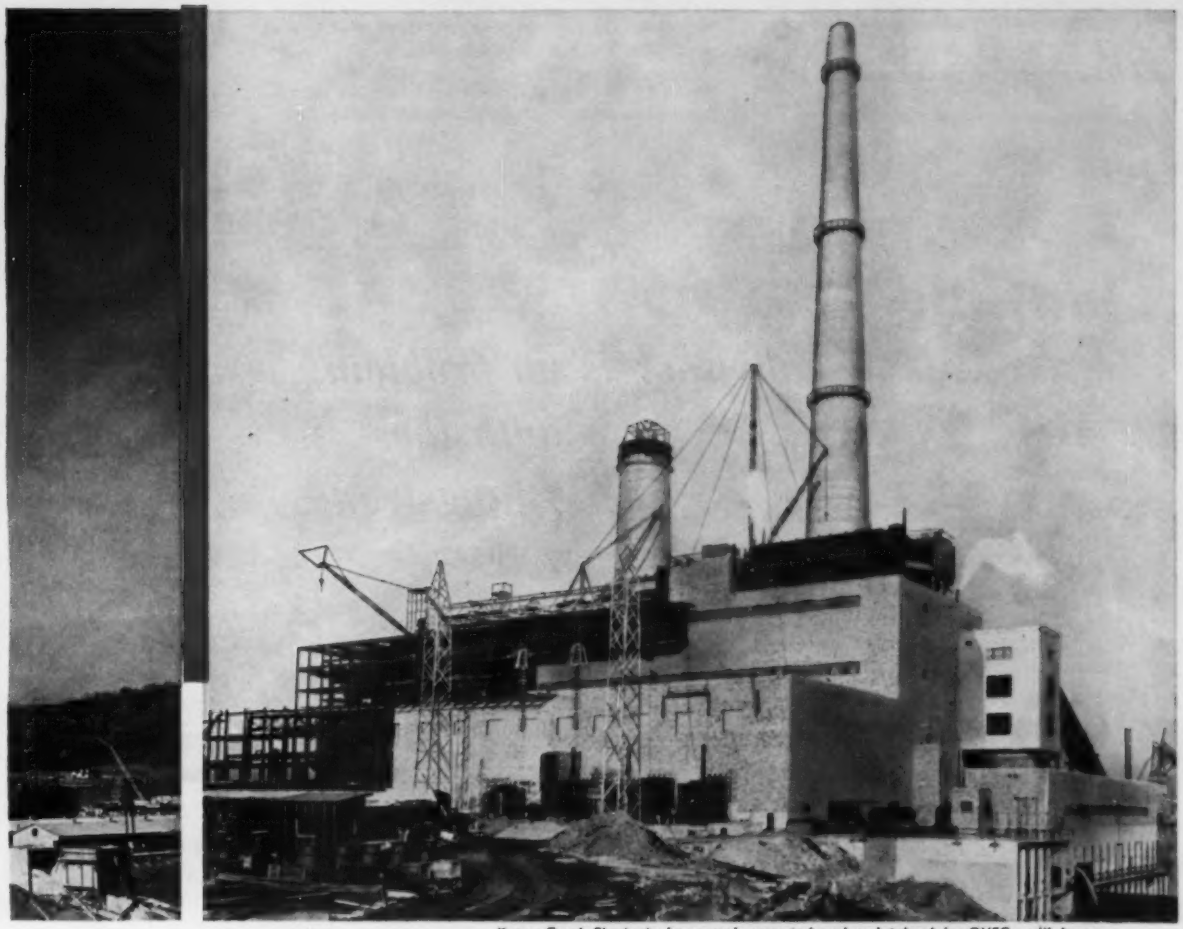


Clifty Creek Plant near Madison, Indiana, is scheduled for completion by the Spring of 1956. Unit No. 1 began delivering power in late January 1955. The Clifty Creek Plant will be owned, operated and maintained by IKEC. Its six units will have a total capacity of 1,200,000 kw—20 per cent larger than the Kyger Creek Plant. American Gas and Electric Service Corp. is the plant design engineer.

Once again America's private electric companies have demonstrated their resourcefulness. By combining their knowledge, skills and resources, 15 prominent utilities have accomplished a job of tremendous proportions quickly and efficiently—a job which would have been too big for any one company to handle.

By next year, two new power plants—now under construction as a result of cooperative planning by the 15 companies comprising Ohio Valley Electric Corp. and its subsidiary, Indiana-Kentucky Electric Corp.†—will be ready to supply more than the 15-billion kilowatt-hours of energy annually required for the process of uranium diffusion at the new Portsmouth Area Project. This huge block of power is greater than that used by New York City and is almost half as much electricity as is produced in all of France.

A number of factors relating to fuel, transportation and transmission were responsible for the choice of sites—both on the Ohio River—for the two power plants needed to meet this great demand. Now par-



Kyger Creek Plant—to be owned, operated and maintained by OVEC—will have five units with a total capacity of 1,000,000 kw. Unit No. 1 began delivering power in late January 1955, a full month ahead of schedule. The last unit is scheduled for completion by early 1956. Sargent & Lundy of Chicago is the design engineer.

tially completed, Kyger Creek and Clifty Creek plants will eventually have a combined capacity of 2,200,000 kw, and while Clifty Creek will be larger, the two plants will be similar.

Kyger Creek's five B&W Open-Pass Boilers will each produce 1,330,000 lb of steam per hr at 2000 psi and 1050 F, with reheat to 1050 F, and six B&W Boilers of the same type and size will furnish steam for kilowatts at Clifty Creek. The utilization of high temperatures, high pressures and reheat at both plants will place them among the most efficient and economical in operation. Together with a comparatively low fuel cost, this high efficiency rate will hold down the ultimate cost of the power produced there.

The choice of B&W Boilers and allied equipment for a project of this importance is an expression of confidence in B&W's contributions to efficient steam generation through intensive research and development covering nearly a century. We will be glad to discuss your boiler needs at your convenience.

†Appalachian Electric Power Company* • The Cincinnati Gas & Electric Company • Columbus and Southern Ohio Electric Company • The Dayton Power and Light Company • Indiana & Michigan Electric Company* • Kentucky Utilities Company • Louisville Gas and Electric Company • Monongahela Power Company** • Ohio Edison Company • The Ohio Power Company* • Pennsylvania Power Company*** • The Potomac Edison Company** • Southern Indiana Gas and Electric Company • The Toledo Edison Company • West Penn Power Company**

*Subsidiary of American Gas and Electric Co.
**Subsidiary of The West Penn Electric Co.
***Subsidiary of Ohio Edison Co.

The Babcock & Wilcox Company, Boiler Division, 161 East 42nd Street, New York 17, N. Y.

BABCOCK & WILCOX

BOILER DIVISION

G-705

why soot is no problem... with the Ljungstrom® Air Preheater

Soot is no problem with the Ljungstrom. Clinging soot or slag is loosened by normal expansion and contraction of the preheater . . . and most of it is blown away by the high-velocity gas streams. What remains is removed by superheated steam or compressed air, fired from oscillating soot blowers, while the Ljungstroms are in operation.

What's more, moderate deposits on the Ljungstrom heating surface have no effect on preheating. For, with the Ljungstrom, heat need not pass through a film-coated wall – but is simply absorbed by a heating surface and *released from the same surface.*

Get all the details on why the Ljungstrom is easier to clean and maintain . . . maintains higher boiler efficiencies. They're in the new, 38-page reference manual, "Ljungstrom Air Preheaters." Write for your free copy, today!

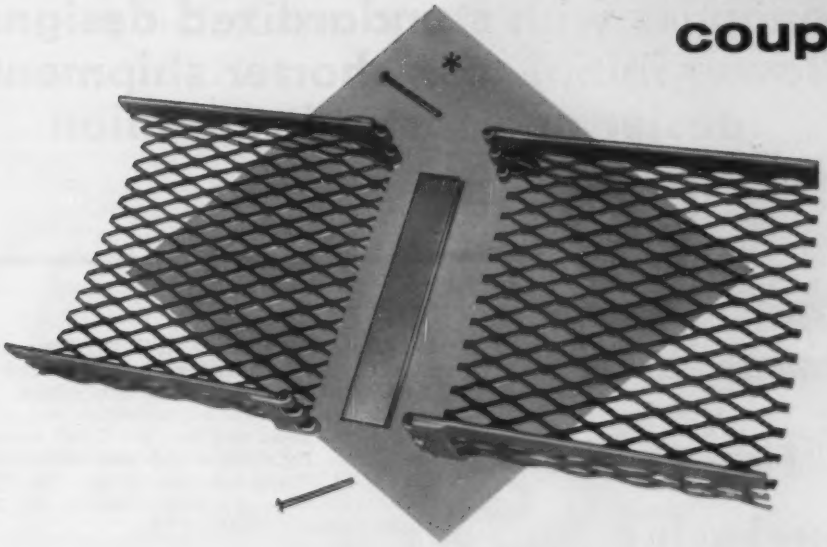
Advantages of the Ljungstrom Air Preheater

- Size for size, recovers more heat than any other type.
- Reduces fuel consumption. Permits use of lower-grade fuels. Increases boiler output and reliability.
- Eliminates cold spots . . . keeps corrosion to a minimum.
- Easier, faster to clean and maintain.
- Requires far less supporting steel and is quickly erected.

The Air Preheater Corporation 60 East 42nd Street, New York 17, N. Y.

ANOTHER EXAMPLE OF Cope EFFICIENCY...

THE NEW 70,000 SERIES COPE CABLE TROUGH with the built-in coupler



up to 80% savings in assembly time

The new 70,000 Series Cope Cable Trough with the built-in Pin-Type Coupler has been specifically designed to give a quick-coupling, stronger and more easily erected system for supporting power, control, and signal cables in industrial plants and generating stations.

The built-in Pin-Type Couplers make it possible for the trough and fittings to be assembled with up to 80% savings in field assembly time.

*PATENT PENDING

Cope Cable Trough is available in five standard widths, (6", 9", 12", 18", and 24") and lengths of 8', 10', and 12' with a wide range of fittings for each width which permits the trough to change direction and elevation to conform to any plant layout.

Find out more about the New 70,000 Series Cope Cable Trough. Write today for further information and the new 16-page Bulletin W-7.

You know Cope by these products

Cope T. J. COPE, INC.

711 SOUTH 50th ST., PHILADELPHIA 43, PA.

Save up to 8% on Power

Many utilities discover new economies with standardized designs... lower initial cost, shorter shipment, easier and faster installation

ALLIS-CHALMERS POWER Transformers

Three Purchasing Case Histories Tell Actual Dollar Savings Possible

1 **A MIDWEST UTILITY SAVED** $6,065.00 on one purchase of an Allis-Chalmers standardized unit on which it was possible to choose a different rated high voltage. For years this utility had purchased transformers with rated high voltage 66,000 delta and four 2½% full capacity taps below normal. By rating a standardized unit with high voltage of 62,700 and full capacity taps of 66,000-64,350-61,050 and 59,400 — a standardized unit was purchased at an approximate savings of 7%.

2 **AN EASTERN STEEL COMPANY SAVED** $1,920.00 with an Allis-Chalmers standardized unit. The new transformer, high voltage 67,000 volts, low voltage 7200 volts, will operate at 6900 volts at slightly reduced kva. This makes possible operation in a bank with an existing 6900-volt transformer. This customer foresees even greater savings when more standardized units are purchased.

3 **A SOUTHERN UTILITY SAVED** $1,557.00 by purchasing Allis-Chalmers standardized power transformers. It was found that three 1667-kva single-phase transformers rated at 13,200 voltage delta with two 2½% full capacity taps above and below normal to low voltage 2400/4160Y could be paralleled satisfactorily with existing non-standard transformers rated 1667 kva having a high voltage of 13,200 delta and taps at 12,540-12,210-11,880 to low voltage 2300/4000 wye (the transformer to be over-excited for 2400/4160 wye output).

ALLIS-

Transformers

Allis-Chalmers standardized design power transformers offer utilities attractive savings in time and money compared to special designs. Standardization eliminates or reduces engineering and manufacturing time, results in savings up to 8% of the total cost of a transformer. Delivery can be made faster than with special transformers. Installation is simplified by standardized location of accessories. If certified drawings are required, they can be obtained immediately in many cases.

Other Features Available

Manufactured in accordance with NEMA and ASA C57.12a Standards, these transformers are available in ratings up to 5000 kva single phase and 10,000 kva three phase. Considerable flexibility is available too. Other features include variations in primary voltages, junction boxes, different types of oil preservation, as well as other mechanical and electrical features.

It will pay to get complete details on savings made possible by Allis-Chalmers standardized transformers. Call your nearby A-C district office or write Allis-Chalmers, Milwaukee 1, Wisconsin, for more information.

A-4429

A-C ALLIS-CHALMERS

CHALMERS

FIRE!

PUT IT OUT IN SECONDS

with a Kidde Portable extinguisher

Unless you get the jump on fire the minute it starts, you stand a good chance of kissing your business good-bye.

That's why it's so important to have a Kidde portable extinguisher near *every* fire hazard in your plant.

Protect motors, electrical equipment, flammable liquids and machinery with Kidde portables. Then, when fire strikes, you're ready for it.

Just grab a Kidde CO_2 or dry chemical portable, aim the horn, pull the trigger, and—Whoosh! No more fire!

Your *next* fire could be your *last*... Contact Kidde today!

Kidde

The words 'Kidde', 'Lux', 'Lux-O-Matic', 'Fyre-Freez' and the Kidde seal are trademarks of Walter Kidde & Company, Inc.

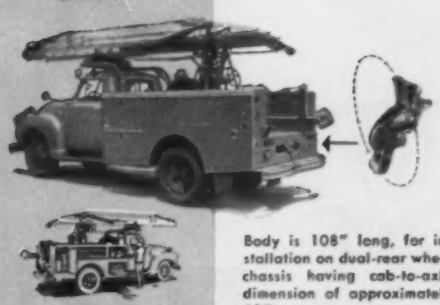
Walter Kidde & Company, Inc.
330 Main Street, Belleville 9, N. J.
Walter Kidde & Company of Canada, Ltd., Montreal—Toronto

POWERS *American*

Series 450 CONSTRUCTION AND OVERHEAD MAINTENANCE BODY

Does the Work of TWO TRUCKS

Ladder can be revolved 360° at elevations from 30° to 75°. In 23'6", 26'6", and 30'6" mechanical units, or 35' hydraulic model.



Body is 108" long, for installation on dual-rear wheel chassis having cab-to-axle dimension of approximately 60"

Derrick utilizes flexible steel cable instead of conventional center leg. Stows in loading area rack when not in use.

Here's a multi-purpose body that does work normally requiring two or more specially-equipped vehicles.

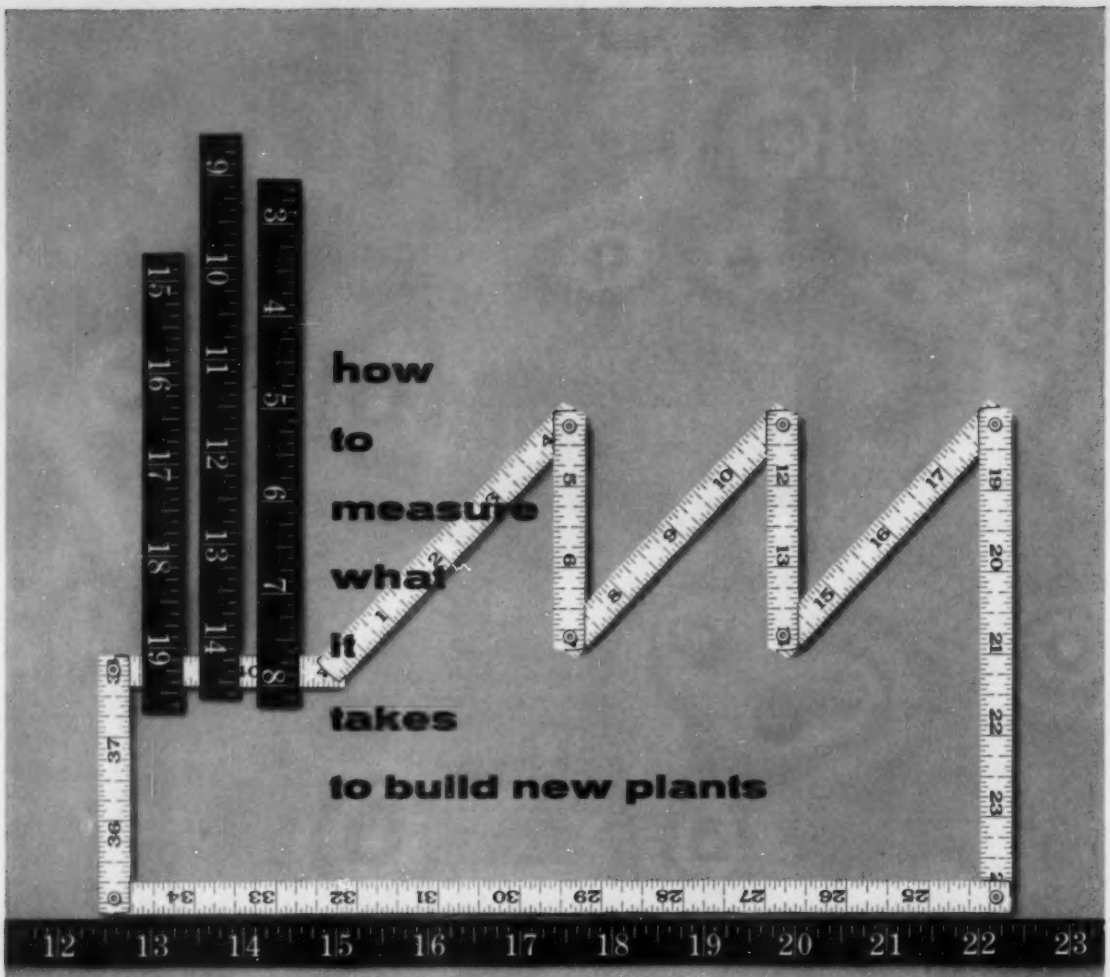
FOR OVERHEAD WORK . . . the body has a Powers-American mechanical or hydraulic Aerial Ladder, in a working height best suited to individual needs.

FOR SERVICE WORK . . . compartments provide space for the orderly storage of a wide assortment of tools and parts.

FOR CONSTRUCTION WORK . . . simplified, easy-to-use derrick handles poles up to 35 ft. in length. A 10,000 lb. underslung winch pays out cable beneath the body floor. A universal swivel sheave permits winch line pull in any direction, without limitation.

COMPLETE DESCRIPTION is given in Bulletin No. 118. A copy, with quotation, is yours for the asking.

POWERS-AMERICAN DIVISION
McCABE-POWERS AUTO BODY COMPANY
5900 No. Broadway • St. Louis 15, Missouri
625 Cedar St. • Berkeley 10, Calif.



Most ingredients that go into a new plant can be measured by feet or yards, pounds or tons. But there are other things—far more important—that physical yardsticks can't size up.

Experience, for example. Ebasco experience spans half a century, and includes the engineering and construction of more than two billion dollars of plants in the United States and abroad.

Skill and integrity are evidenced in each phase of an Ebasco project. Ebasco's highly qualified technical skill is utilized in every part of the work—from site selection and preliminary planning, through finished construction, to successful operation.

Together these unseen elements add up to *quality* construction, the common denominator of every plant built by Ebasco.

If you are considering a new plant, write for our booklet, "The Inside Story of Outside Help". Address: Ebasco Services Incorporated, Two Rector Street, New York 6, New York.

EBASCO

NEW YORK • CHICAGO • DALLAS
PORTLAND, ORE. • WASHINGTON, D. C.

Ebasco Teamwork gets things done anywhere in the world

Appraisal • Consulting Engineering • Design & Construction • Financial & Business Studies • Industrial Relations • Insurance, Pensions & Safety
Purchasing, Inspection & Expediting • Rates & Pricing • Research • Sales & Public Relations • Space Planning • Systems, Methods & Budgets • Tax • Washington Office

Any electric utility company

with peak and/or seasonal demands that strain existing facilities, should consider this:

General Motors Electro-Mobile Power may be purchased for single or multiple applications—to fit the KW. needs—requiring no greater an investment than *present* power demands justify.

The capital investment in Electro-Mobile Power is far less than that of a steam installation for low load factor uses.

The fixed charges on Electro-Mobile Power units are materially less than those of any alternate power source.

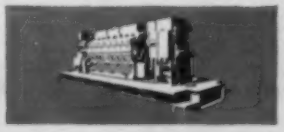
Line loss is reduced to a small fraction by placing this flexible Electro-Mobile equipment at the point of need.

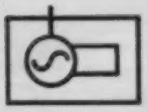
The equipment is designed to be moved from site to site with negligible cost in time or money.

Write for simple formula explaining investment advantages of Electro-Mobile Power:

ELECTRO-MOTIVE DIVISION

GENERAL MOTORS • LA GRANGE, ILLINOIS

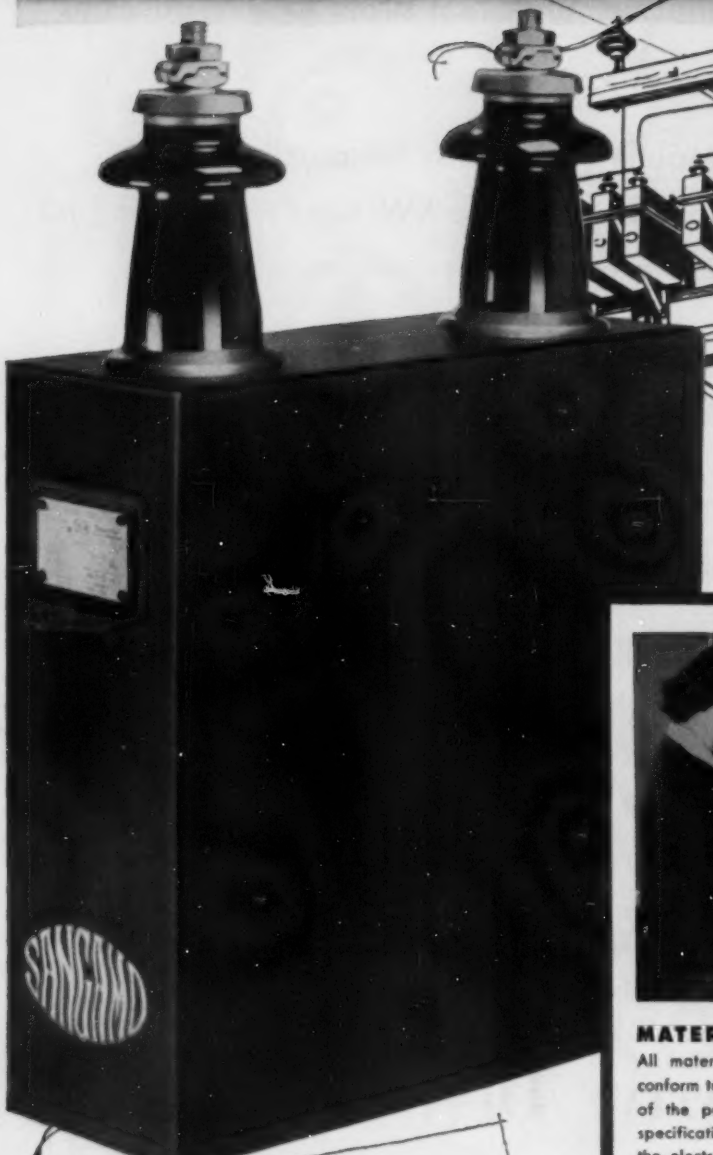




Rail car, truck trailer and portable units—350 to 1,000 KW.

Sold and serviced directly through a manufacturer's organization. Electro-Motive Division offices located in: New York City, Chicago, Jacksonville, St. Louis and San Francisco.

NOW...YOU CAN GET SANGAMO



NOW AVAILABLE IN THESE RATINGS:

2400 Volts.....25 KVAR
7200 Volts.....25 KVAR
Singlephase.....60 Cycles

MATERIALS AND PROCESS TESTING

All materials used in Sangamo Power Capacitors must conform to rigid specifications. Only paper dielectric made of the purest virgin pulp and meeting Sangamo's own specifications is ever accepted and the aluminum foil for the electrodes must be absolutely free of flaws and contaminants. Naturally, Sangamo Power Capacitors are subjected to frequent and exacting tests at each stage in their assembly.

GUARANTEE

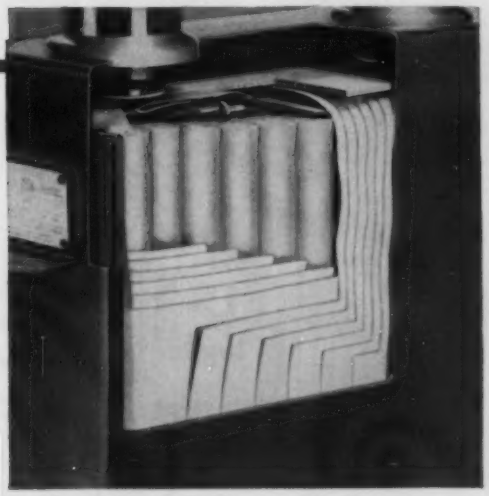
In this new venture Sangamo guarantees its customers—the utilities—the same excellent performance from this new product which its other products have given in the past.

SANGAMO

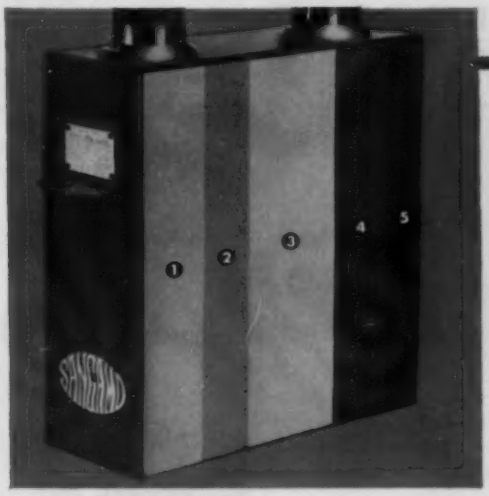
POWER CAPACITORS . . .

they're built for long life!

Power capacitors are only as stable in performance as the engineering, materials and processing techniques which go into their making. Each of these three basic factors is given minute attention in the manufacture of Sangamo Power Capacitors. Take the building where Sangamo Power Capacitors are produced. It's brand new, has the very latest in processing equipment, and is a "controlled conditions" plant. Controlled conditions mean that dust, for instance, is completely filtered out so there is little danger of contamination from this source. In this new plant, even the humidity can be regulated to assure product uniformity. But get the whole story. Write today for your copy of Bulletin 1120 or contact the Sangamo representative in your area.



PROTECTED INSIDE... Case and both terminals are completely filled with Sangamo *Diaclor*, a high-strength, low loss, liquid dielectric, which enables safe operation in ambient temperatures as low as minus 40°C. Multi-layered Kraft insulating paper folded completely around the internal pack assembly provides solid insulation to case at all points.



PROTECTED OUTSIDE... To obtain the finish which gives enduring protection against corrosion and abrasion, five steps are required. First, the case is tin-plated inside and out. After impregnating and sealing, the capacitor is sand-blasted, preparatory for aluminizing. Then several coats of molten aluminum are sprayed on the case. Fourth, a primer coat of paint is applied. The final step, the finish coat, consists of a highly weather-resistant paint.

SANGAMO ELECTRIC COMPANY

SPRINGFIELD, ILLINOIS

PC55-1

Alcoa's latest Customer Service saves Reel Setups, Cable Splices

Here's a reel advantage—pioneered by Alcoa—that means far fewer reel setups, fewer splices to be made by your line crews.

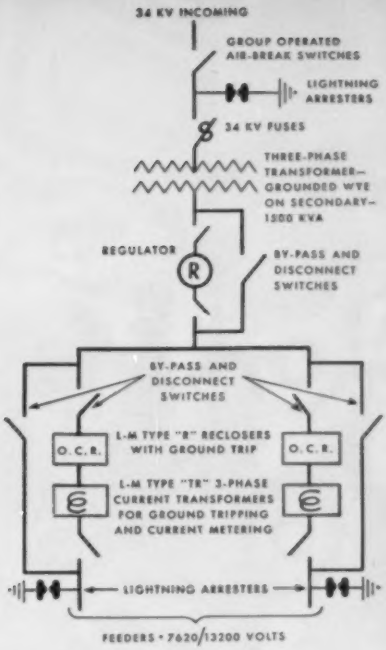
Alcoa is now shipping, at its customer's request, transmission conductor on the largest reels ever used for aluminum cable in the United States. Eight feet in diameter, five feet wide, they make it possible to ship a 7,400-foot length of 1.75" diameter Expanded ACSR on each reel.

These giant reels are the latest example of service, again proving Alcoa to be best from the first, first with the best. Consult Alcoa for help with your conductor problems.

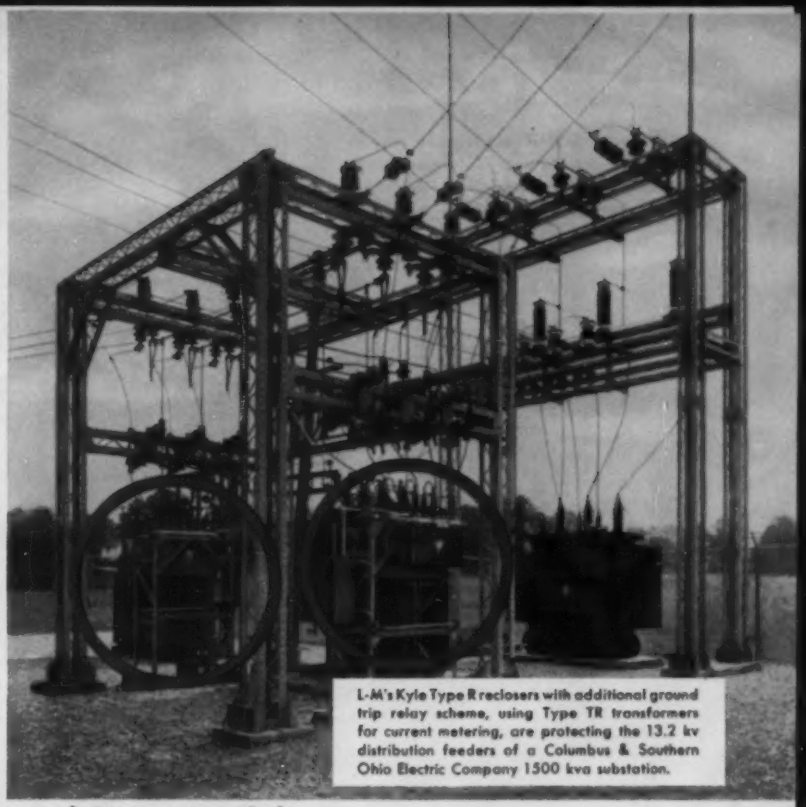
ALUMINUM COMPANY OF AMERICA,
2100-C Alcoa Building,
Pittsburgh 19, Pa.

ALCOA ALUMINUM

ALUMINUM COMPANY OF AMERICA



One line diagram of the substation at right. This 34 kv to 13.2 kv substation has a bus regulator and two 100 amp. Kyle Type R heavy-duty reclosers, assuring quality and continuity of service to the customer at all times.



L-M's Kyle Type R reclosers with additional ground trip relay scheme, using Type TR transformers for current metering, are protecting the 13.2 kv distribution feeders of a Columbus & Southern Ohio Electric Company 1500 kva substation.

Take Advantage of Additional Protective Schemes . . .

New Control Devices Now Available with Kyle Type R 3-Phase Reclosers

Methods are given for obtaining auxiliary protective schemes used to supplement the normal series over-current tripping of the recloser.

By **FRANK McSTAY**
Manager
Kyle Products Sales
Line Material Company

Electric service continuity is essential today, as customers depend more and more on electricity for operation. Utility engineers as well as Line Material engineers are aware of the problems involved in designing and operating a protected system economically.

To meet this challenge, L-M engineers have developed a heavy-duty recloser that provides simultaneous tripping of all three phases on feeders with heavy loads and high fault currents. This recloser provides series tripping, reclosing, and dual timing to permit coordination with fuses; and offers facilities to adapt almost any auxiliary relays and indicating equipment to it. Thus it provides the best protective scheme for your system.

Applications for the Type R

The Kyle Type R recloser is a self-contained unit that can be installed on a line pole as well as in a substation. It is a rugged, power-class recloser designed to replace breakers in substations with up to 100,000 kva fault capacity. In addition to segregating permanent faults from the system, the Type R recloser is capable of clearing faults of a transient nature much faster than is normally accomplished with station breakers.

Type R reclosers are also installed on the feeders outside substations that have slow breaker operations, providing for fast (2-cycle, maximum) fault clearing time. This effectively and economically improves operation, provides transient fault protection for the distribution system, relieves the duty on the station breakers, reduces the number of service calls, and greatly enhances service continuity.

Almost any supplementary relaying scheme is adaptable to the Type R recloser operation:

Ground Trip Solenoid is a self-contained ground relay possessing its own dual time-current characteristics.

Shunt Trip Solenoid is a tripping device only, designed to operate the recloser when energized from a supplementary relay scheme.

Shunt Lockout Solenoid is a lockout device only; locks out the recloser instantly. Like the shunt trip solenoid, it is energized by remote control.

Auxiliary Switch provides positions for remote-control indication or low-voltage-control switching of apparatus used in conjunction with the Type R recloser.

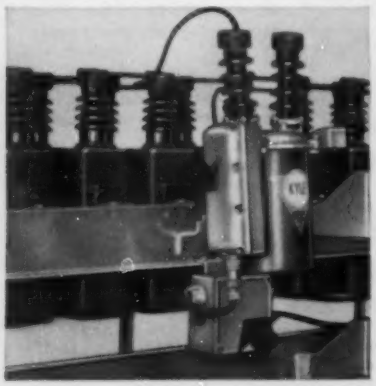
LINE MATERIAL
Kyle® Reclosers

Get the Whole Story on Type R Reclosers

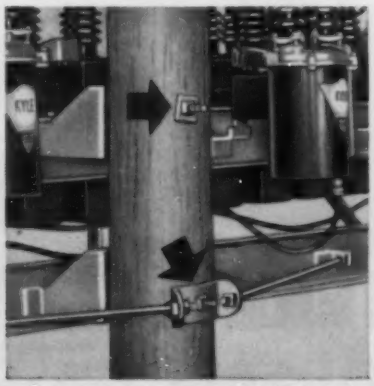
Ask your L-M Field Engineer for complete information on Type R Reclosers and Bulletin CR1C. Or write Mr. McStay, Line Material Co., Milwaukee 1, Wisconsin (a McGraw Electric Company Division).

L-M's new single-row switched capacitor rack hugs the pole, provides greater accessibility. Assembly is easier to install, inspect, and maintain.

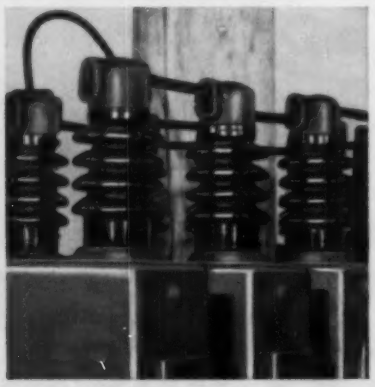
Junction Box: provides one connection point for control wiring; assures quick, easy installation and maintenance. Also note plug-in connection to switch control box.

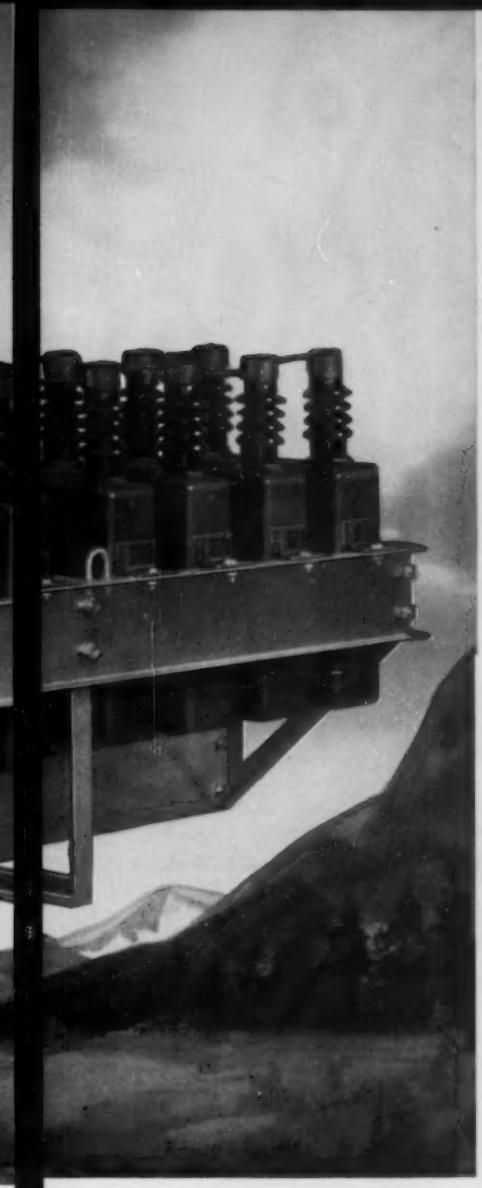


Direct Pole Mounting: Only two bolts are required to mount L-M's single-row rack, greatly reducing installation time and pole space requirements.



Bird-Proof: an outstanding feature is the bird-proof construction. Neoprene rubber caps cover the terminals, and high-voltage connections are made with 5 kv insulated conductor.





Dependable Kyle® Switch: racks are supplied with L-M Kyle Type NR Oil Switches, 200 ampere thermal rating and full 150 ampere nominal capacitive rating at 15 kv.

Greater Accessibility, Less Bending Moment...

L-M's New Single-Row Capacitor Rack For Direct Pole Mounting

L-M's factory-assembled and wired, single-row capacitor racks are easier to install, inspect, and maintain. Center of gravity is close to pole, which reduces bending stress on pole.

By **N. K. DELANEY**
Manager of Capacitor Sales
Line Material Company

L-M's outstanding Elemex® capacitors are now available in single-row capacitor racks for direct pole mounting. The racks are factory-assembled and wired, shipped ready for installation on distribution systems rated 2400 to 13,800 volts. Bank sizes may be 225 or 300 kvar.

Single-Row Design

New single-row design provides greater accessibility; assures easier inspection and maintenance of the unit. In addition, L-M's new design brings the center of gravity closer to the pole, and thus reduces the bending stress on the pole.

Direct Pole Mounting

You can reduce installation time and pole space requirements with L-M's direct pole-mounting design. Direct pole mounting eliminates double hanger arm and kick arm. All you do is bolt to pole and connect.

Switched racks are provided with L-M's rugged, dependable, motor-operated "NR" switches. The switches are easily accessible for hook-stick operation. They are equipped with an exclusive plug-in connection for control wiring. This provides a quick, convenient means of disconnecting the switch for servicing.

Get Complete Information

Ask the L-M Field Engineer for complete information about L-M's new single-row capacitor rack and other capacitor equipments, also about L-M's Capacitor Bank Engineering Service. Or write Mr. Delaney, Line Material Company, Milwaukee 1, Wisconsin (a McGraw Electric Co. Division).

Other Features Of L-M's Single-Row Capacitor Rack Assemblies

- The single-row capacitor rack assembly incorporates many desirable features, assuring greater accessibility, dependable service. These include:
- Only one connection point for control wiring.
- Disconnect plugs on switches; switches can be easily removed for maintenance.
- Interchangeable switch mounting positions to meet various primary circuit configurations.
- Complete bird-proof construction; neoprene rubber caps on terminals, plus 5 kv insulated conductor for high-voltage connections.
- Lifting yoke; makes pole top hoisting easy.

L-M Offers Complete Line of Capacitor Equipments

Factory-assembled single-row or standard three-row racks for pole-mounted banks. Sizes with 15 kv spacing up to 300 kvar switched and 375 kvar unswitched assemblies with 25 kvar units.

Factory-assembled blocks in complete range of NEMA-standard sizes and ratings. Blocks save time and money in assembling large banks.

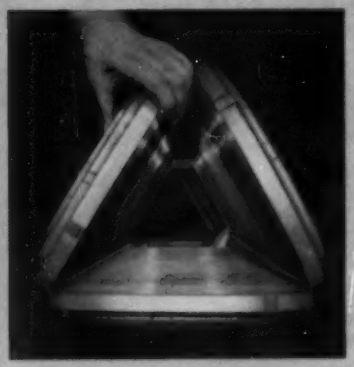
Metal-enclosed capacitor equipments in all NEMA-standard distribution voltage sizes and ratings.

VDS Method factory-assembled block for large multi-step capacitor banks at transmission voltages, an L-M-exclusive method that reduces cost of switching equipment.

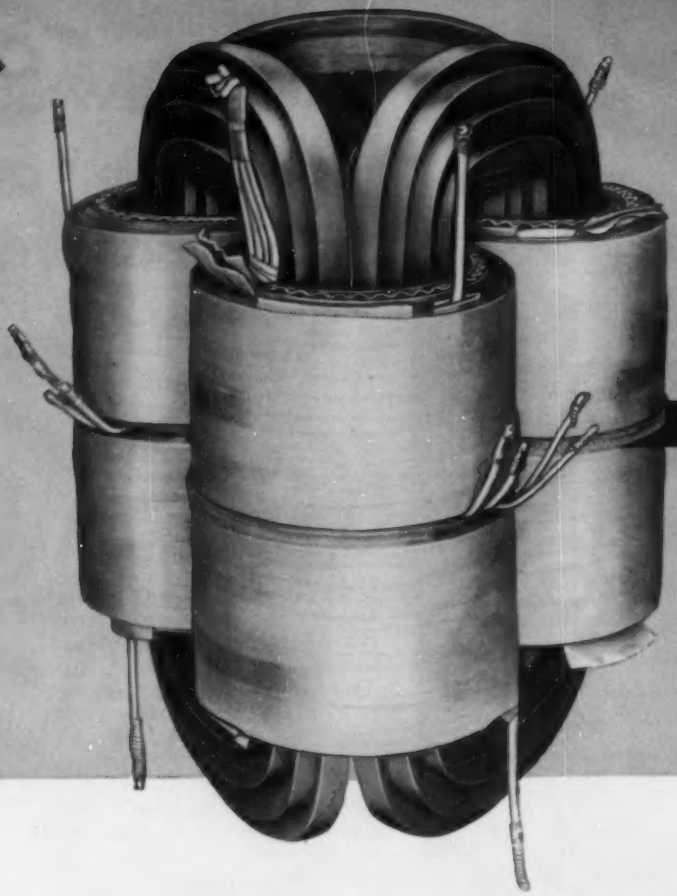
LINE MATERIAL

Elemex® Capacitors

The L-M Tri-Wound core-coil configuration results in a compact and highly efficient structure. The inherent characteristics of the continuously wound core and the round coils offer distinct design and operating advantages.



The core structure consists of three continuously wound cores of oriented-grain silicon steel strip assembled into a balanced magnetic unit.



The new Tri-Wound is built to resist short-circuit forces. Note the strong steel frame and heavy clamping bolts. Sturdy maple blocks at top and bottom are tightened and clamped against the coil ends to prevent axial movement.

Completed Tri-Wound 3-phase transformer. The unit is smaller and lighter than L-M's previous type. The transformer provides all the well-known advantages of L-M's single-phase Round-Wound transformers.

Outstanding Characteristics of L-M Tri-Wound Transformers

High short-time overload capacity

Good regulation at all power factors

High impulse level with ample creepage distance and generous insulation

High short-circuit strength

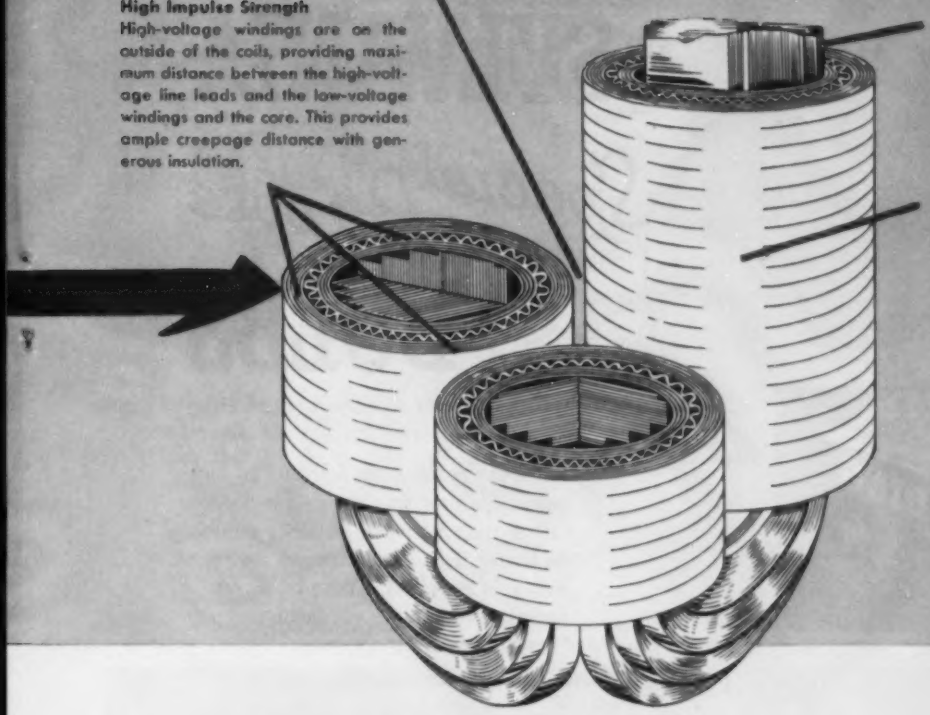
Filled with ORTO®, L-M's oxidation-resistant transformer oil, inhibited for longer life

Available in sizes 9, 15, 30, 45, and 75 kva

"Tri-Wound" and "Uni-Wound" are Line Material Company trade-marks.

High Short-Time Overload Capacity
Core clamps are designed to provide a chimney effect between the three coils. This chimney effect plus the exposed outer coil surfaces provides effective cooling. Oil ducts, located throughout the coil, contribute to uniform, efficient cooling.

High Impulse Strength
High-voltage windings are on the outside of the coils, providing maximum distance between the high-voltage line leads and the low-voltage windings and the core. This provides ample creepage distance with generous insulation.



Low Exciting Current
The continuously wound core of oriented-grain silicon steel strip provides a uniform flux path, thus permitting low exciting current.

High Short-Circuit Strength
Round coils naturally resist radial short-circuit forces without damage or distortion. Sturdy core clamps and strong blocking help prevent axial movement of the windings under short-circuit conditions.

For 3-Phase In 9 To 75 kva Sizes...

L-M's New Tri-Wound® Transformers

Apply Round-Wound® principles to 3-phase construction to provide light weight and small size, high overload capacity, high short-circuit strength, high impulse strength.

By **JAMES G. EVERHART**
Chief Engineer
Transformer Division
Line Material Company

L-M's new *Tri-Wound* fills the need for a smaller, lighter 3-phase transformer that utilizes the full advantages of a continuously wound magnetic core and round coils. This new Tri-Wound transformer is now available in sizes 9 through 75 kva and in all voltage classes through 13,800 volts.

L-M's larger-sized 3-phase transformers are the new *Uni-Wound*, which provide Round-Wound's balanced performance in sizes from 112½ through 500 kva.

Continuously Wound Core

The Tri-Wound transformer consists of three cores, continuously wound of oriented-grain silicon steel strip. The bare cores are annealed after fabrication, and placed as shown in the illustration. Then round coils are wound directly onto the three core legs by L-M's exclusive winding process.

Tri-Wound is Smaller and Lighter

Integrating the core-coil assemblies into one unit provides a substantially lighter, smaller 3-phase transformer. For example, the 75 kva Tri-Wound is approximately 250 pounds lighter than previous designs. In addition, the over-all height of this new Tri-Wound unit has been reduced about 1½ feet, with very little increase in the projected floor space.

Balanced Performance

Performance characteristics of the Tri-Wound transformer have been coordinated to give good over-all balanced operation, with each characteristic being considered in its relationship to the over-all performance of the transformer.

Get Details of Tri-Wound Transformers

Ask the L-M Field Engineer to give you full details; or write Line Material Company, Transformer Division, Zanesville, Ohio. (Line Material Company is a McGraw Electric Company Division.)

LM® LINE MATERIAL Transformers

192

The **biggest news** in home lighting is still-

SYLVANIA

Special-Purpose BULBS

YOUR CUSTOMERS are learning to buy bulbs in a new way, now—for *purpose* rather than by wattage. With emphasis on better lighting all around the home, Sylvania Special-Purpose bulbs are rapidly overcoming old-fashioned "watt-phobia."

These outstanding, engineered-for-application bulbs give greater conversion efficiency (more usable light per socket) than ever before available in a household lighting bulb.

The Sylvania Reading Lite, 150 watts, with its "homogenized" bulb brightness, reduces glare as recommended by sight specialists.

The Sylvania Kitchen Lite makes available a 150-watt bulb small enough to fit standard home fixtures.

Your Sylvania representative will be glad to show you how many power companies have benefited by helping their customers secure the advantages of modern high-wattage illumination. Just phone or write.

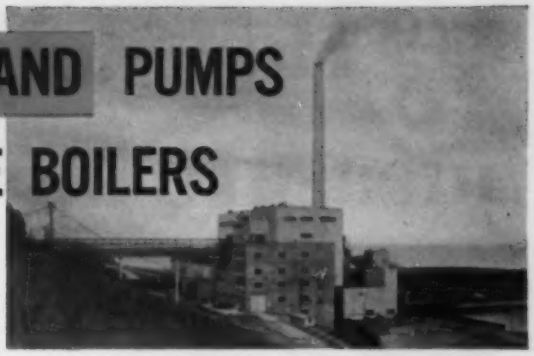
SYLVANIA ELECTRIC PRODUCTS INC.
Lighting Division, Salem, Mass.
In Canada: University Tower Bldg., Montreal, P.Q.

LIGHTING • RADIO • ELECTRONICS
TELEVISION • ATOMIC ENERGY

Keep your eye on SYLVANIA

...fastest growing name in sight

10-STAGE INGERSOLL-RAND PUMPS SUPPLY HIGH PRESSURE BOILERS AT OAK CREEK

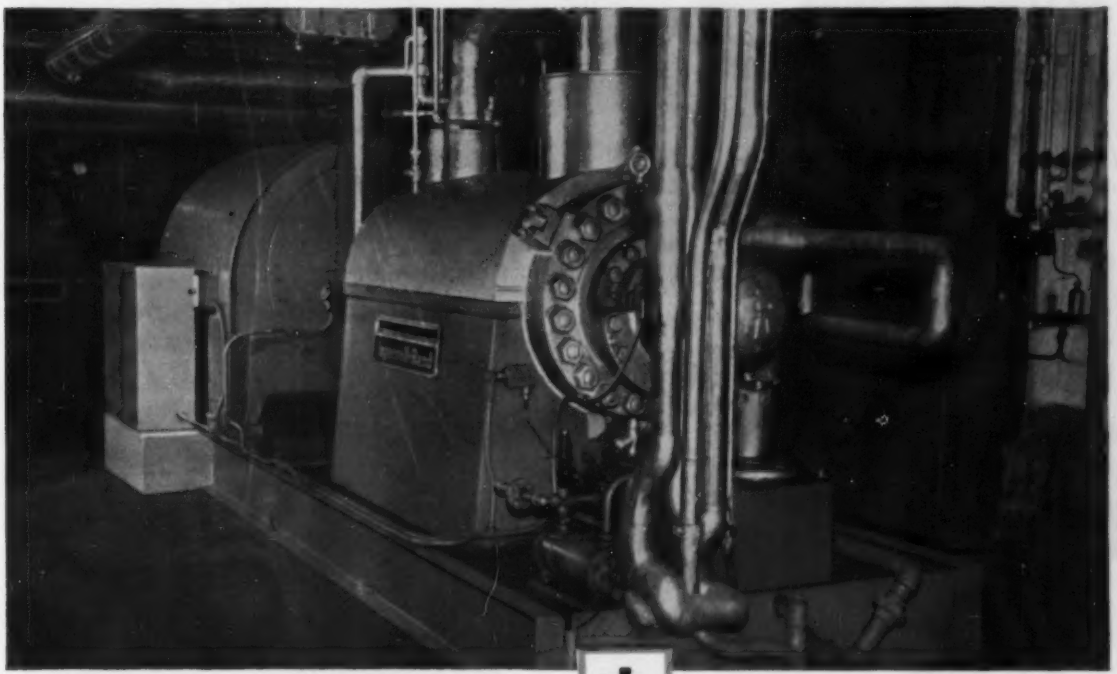


Double-Case Boiler-Feed Pumps give dependable service at Wisconsin Electric Company's New Oak Creek Station

Though still growing, the Oak Creek Station of Wisconsin Electric Company has had 120,000 kw Unit No. 1 on the line for a year. And Unit No. 2 will soon be put in operation, bringing total plant capacity to 240,000 kw. Two additional units of the same capacity are yet to be installed.

The Ingersoll-Rand CHTA pumps supplying feedwater to the controlled-circulation boilers have had a chance to prove their performance on the job. Four of these huge 10-stage double-case pumps are now installed — a pair for each 120,000 kw generating unit. Pumps are rated 425,000 lb./hr. each at a pressure of 1900 psi.

For *proved performance* at *high pressures*, it pays to specify I-R boiler feed pumps. Your Ingersoll-Rand pump specialist will be glad to help you plan your next installation.



Ingersoll-Rand

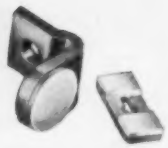
Cameron Pump Division
11 Broadway, New York 4, N. Y.

An Ingersoll-Rand 10-stage Class CHTA pump serving Unit No. 1 at Oak Creek Station.

10-81

PUMPS • COMPRESSORS • VACUUM EQUIPMENT • GAS & DIESEL ENGINES • AIR & ELECTRIC TOOLS • ROCK DRILLS

How do your contacts measure up to their jobs?



Are they under-designed... or over-designed?

To be *right* for your needs, contact materials and contact designs must be evaluated in terms of *all* characteristics of the job they are expected to perform. Current and voltage in the interrupted circuit . . . nature of the electrical load . . . number and frequency of operations . . . contact gap and pressure . . . ambient temperature and atmosphere . . . and many other factors must be thoroughly considered, if contacts are to match both the performance and cost requirements of the application.

By consulting with Mallory engineers, particularly during the engineering and design stages of a contact application, you will add to your own facilities the full scope of Mallory's specialized experience in contact research and manufacturing.

- **The wide selection of materials** developed by Mallory metallurgical research encompasses practically every kind of contact service condition.
- **Standard designs** can often be recommended for standard application conditions . . . at sizable savings to you.
- **Special designs** are engineered by a staff which has the knowledge gained during thirty years of contact development.
- **Economical fabrication** of contacts and complete contact assemblies, in Mallory's manufacturing department, can save you money and simplify your own production.

For a consultation on your own contact problems, or for a copy of the Mallory Contact Catalog, write or call Mallory today.

Expect more . . .

Get more from

P. R. MALLORY & CO. Inc.

MALLORY

P. R. MALLORY & CO. Inc. INDIANAPOLIS 6, INDIANA

In Canada, made and sold by Johnson Matthey & Mallory, Ltd., 110 Industry Street, Toronto 15, Ontario.

Serving Industry with These Products:
Electromechanical—Resistors • Switches • Television Tuners • Vibrators
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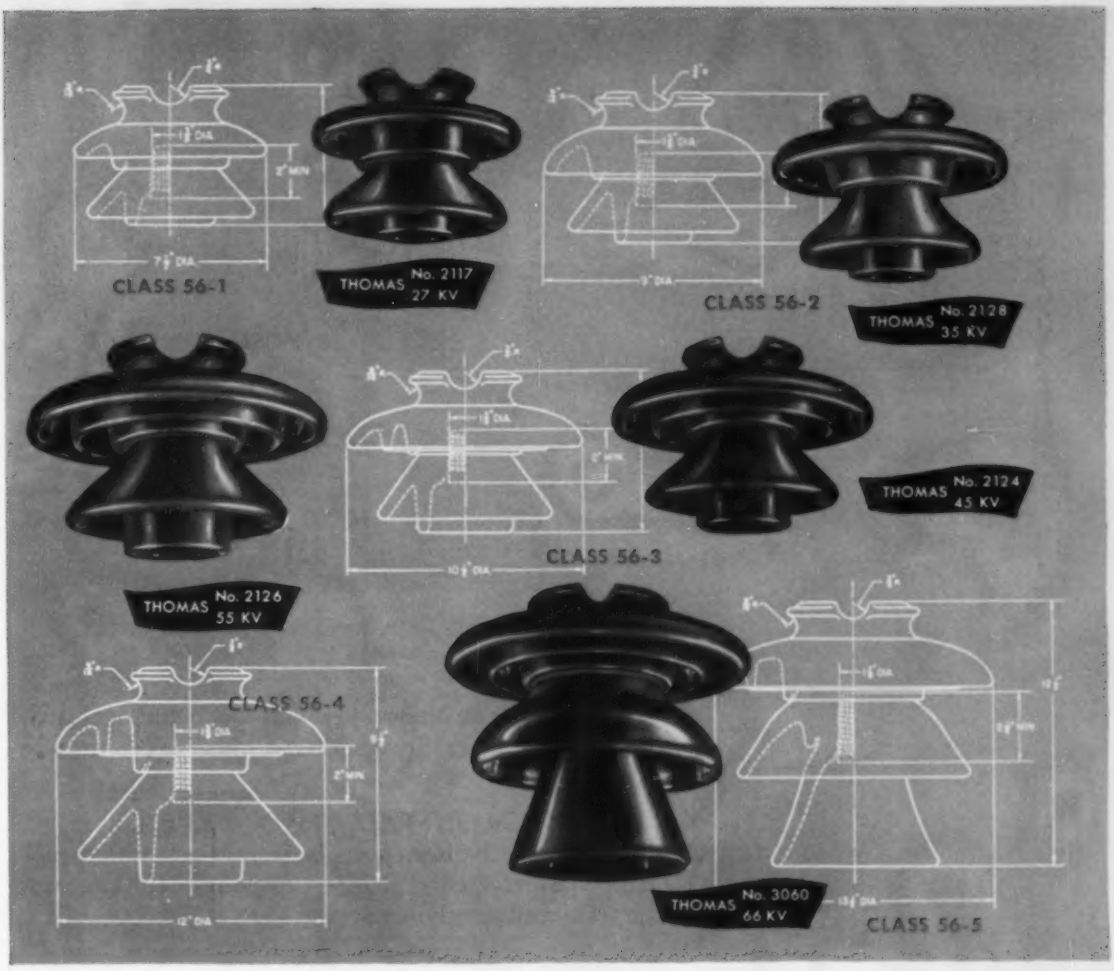
Metallurgical—Contacts • Special Metals and Ceramics • Welding Materials



THOMAS makes all Five

EEI-NEMA STANDARDS show five designs of high-voltage pin-type insulators. Although we catalog 10 high-voltage pin-type designs, we are 100% behind any standardization that we believe helps the Industry. Therefore, we suggest that Users specify the five EEI-NEMA Standards for their high-voltage pin-type requirements.

Thomas insulators are backed by 82 years of ceramic experience and knowledge. Quality materials, precision manufacturing and PROOF OF PERFORMANCE make THOMAS porcelain the standard of comparison for discriminating engineers throughout the Electrical Industry.

Specify Thomas EEI-NEMA STANDARDS for your porcelain requirements. These Insulators are offered with the Thomas, Patented, Noise-Free, under-glaze treatment at no extra cost. Simply specify the catalog number with the suffix "Q-T."

The R. Thomas and Sons Co.

LISBON, OHIO

1873 THOMAS INSULATORS our 82nd year RELIABILITY 1955

For Power Distribution use NELSON

LOW VOLTAGE METAL-ENCLOSED DRAWOUT SWITCHGEAR

15 to 6,000 Amperes Continuous
15,000 to100,000 Amperes I. C.
600 Volts A-C, 250 Volts D-C

Weatherproof Switchgear Unit

Assembly with 15,000 A.I.C. breakers stacked four high

Assembly with 2,000 Ampere and 4,000 Ampere Breakers

When you use Nelson low voltage, metal-enclosed, air circuit breaker drawout switchgear, you gain in many ways.

MINIMUM INSTALLATION EXPENSE is assured because Nelson gear is factory-assembled and factory-tested, then is shipped to your plant site as a *complete* unit, ready for service!

MAXIMUM SERVICE CONTINUITY is assured through the use of interchangeable air circuit breakers which are mounted on carriages that roll on wheels, permitting breakers to be withdrawn and replaced quickly.

REFINEMENTS IN CONSTRUCTION include: extra-rigid self-supporting frames; concealed door hinges; silver plated bus connections; and handsome, durable finish applied to "Paintlok" steel.

Furnished for indoor or outdoor service, Nelson low voltage switchgear meets NEMA, AIEE and ASA specifications and is custom-built to each customer's requirements. Write for valuable, 12-page, descriptive bulletin.

NELSON *Electric* MANUFACTURING CO.
TULSA, OKLAHOMA

217 N. DETROIT AVE. TELEPHONE 2-5131

Another Utility Case History

Since 1939: thousands of poles preserved with low-cost PENTA

Since WISCONSIN POWER AND LIGHT COMPANY installed its first Penta-treated pole 16 years ago, the company has placed nearly 15,000 more Penta-treated western red cedar and southern yellow pine poles, and countless western fir crossarms, in southern Wisconsin. Today, even the oldest of these units are as good as new, have *many more years* of service ahead of them—an impressive example of lasting Penta wood protection!

ELIMINATE REPLACEMENT OF CROSSARMS WITH PENTA

Not only does it cost $5 or more to replace a single crossarm, but consider the trouble and expense of freighting timber, working "hot" lines, switching attachments to thousands of new crossarms a year! Penta eliminates crossarm replacement by protecting wood against rot and insect attack. Crossarms treated with Penta last the 30-year lifetime of a pole! And the cost of preserving wood with Penta is surprisingly low, in fact the cheapest insurance you can buy!

SPECIFY PENTA PROTECTION for Poles . . . Crossarms . . . Transformer Platforms . . . Braces . . . Control Boxes . . . Planking. Mail coupon below for list of more than 85 treating plants that will apply Penta for you, and for FREE Penta booklet, "Poles and Crossarms."

PENTA-TREATED WOOD DOESN'T BURN

Penta stays locked in wood, can't bleed or leach out! That's why Penta-treated wood is clean, can't "burn" hands or stain clothing.

MONSANTO
CHEMICALS – PLASTICS

SERVING INDUSTRY, WHICH SERVES MANKIND

Organic Chemicals Division
MONSANTO CHEMICAL COMPANY
Box 478-D-2, St. Louis 1, Missouri

Please send: ☐ List of Penta-treating plants
☐ FREE "Poles & Crossarms" booklet

Name.....

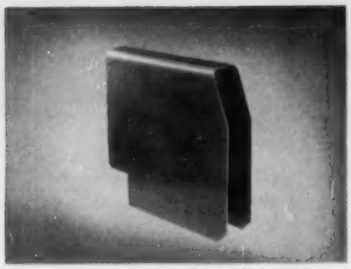
Address.....

City..... *State*.....

C-D-F HANDLES THE COMPLETE JOB. An oil circuit breaker component is made from two Dilecto laminated plastic tubes, with a threaded ring joining the assembly. From raw materials to finish machining C-D-F does it all!

C-D-F KNOWS HOW TO MACHINE PLASTICS. A bus bar gets a covering of molded Dilecto over copper supplied by the customer. The plastic ends are skillfully trimmed on a smooth saw.

C-D-F MOLDS MANY SPECIALTIES. This shaft insulator for a circuit breaker is molded from C-D-F's cloth-based industrial thermosetting plastic, Celoron. Note complexity of mold, clean detailing.

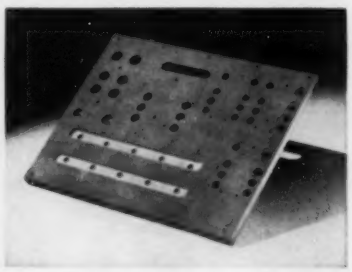


C-D-F USES MODERN METHODS. Large quantities of arc chute barriers are made from paper-based Dilecto. Operations include pressing, cutting, post-forming and trimming.

DEPENDABLE equipment RELIES on C-D-F INSULATION!

C-D-F OFFERS UNIQUE MATERIALS. This contact shaft for an air circuit breaker is another example of molded C-D-F Celoron used in switchgear because of its high impact strength.

C-D-F IS A SKILLFUL ASSEMBLER. Made from Grade C rolled Dilecto tubing, these pots are turned, bored, slotted. Then a macerated plastic end is inserted and arc resistant varnish finish applied.



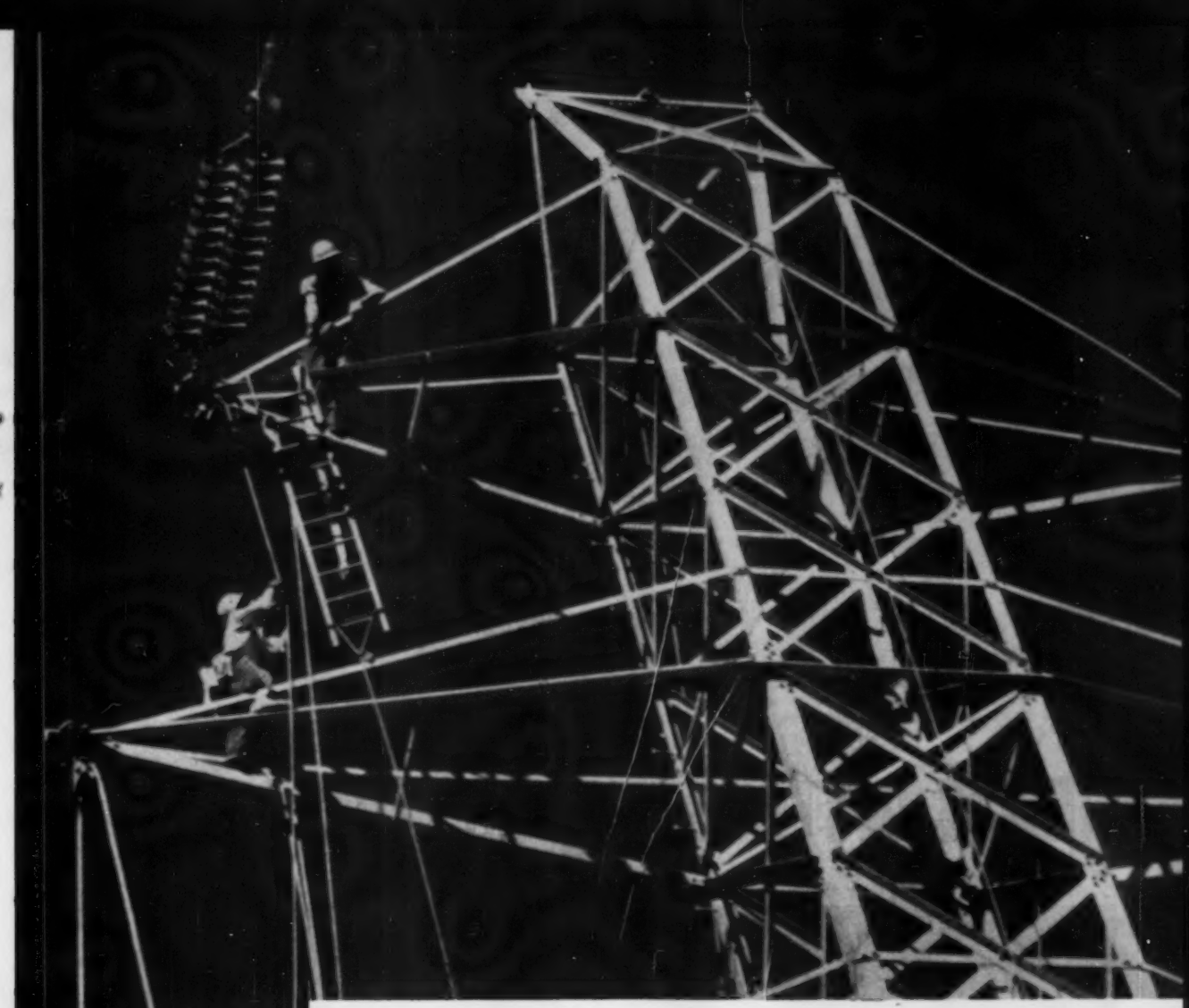
C-D-F UNDERSTANDS THE ELECTRICAL INDUSTRY'S NEEDS. Precisely machined to close tolerances, Dilecto panel boards guarantee dependable insulation, help designers save space.

See our catalog in Sweet's Design File for basic product data and sales offices. Write for detailed information, or send us your print for quotation.

CDF *Continental-Diamond Fibre*

CONTINENTAL-DIAMOND FIBRE COMPANY

NEWARK 15, DELAWARE



The Men on the Tower

This picture could have been made at 3 A.M. or any other late, overtime hour. For when there's a job to be done . . . and time is of the essence, the men who install the nation's high voltage power lines are loyal to their responsibility.

These field crewmen and linemen are as indispensable to the power industry as the American Bridge steel transmission towers they erect and the cables they string. They are literally part of the skilled team which provides and maintains the world's greatest electrification program.

They are our partners in progress. And we here at American Bridge proudly salute them for their conscientious, unflinching attention to their work.

AMERICAN BRIDGE DIVISION, UNITED STATES STEEL CORPORATION, GENERAL OFFICES: 525 WILLIAM PENN PLACE, PITTSBURGH, PA.
Contracting Offices in: AMBRIDGE · ATLANTA · BALTIMORE · BIRMINGHAM · BOSTON · CHICAGO · CINCINNATI · CLEVELAND · DALLAS · DENVER · DETROIT · ELMIRA · GARY
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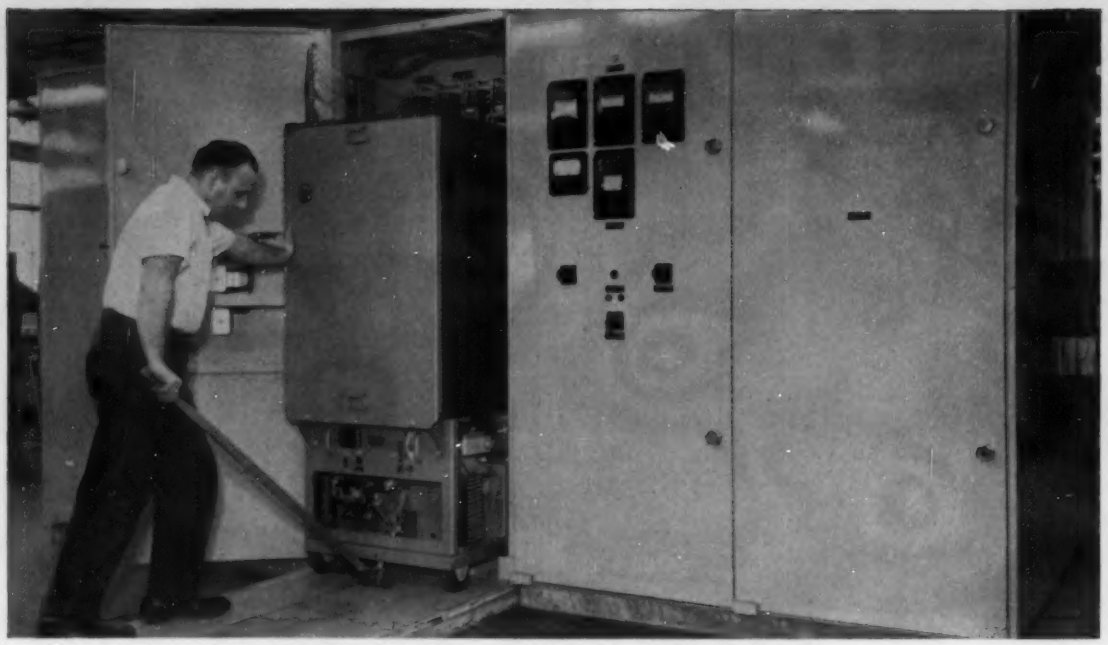
AMERICAN BRIDGE

USS

UNITED STATES STEEL



Metal-clad switchgear. Horizontal drawout air circuit breakers in rigid, all-welded enclosures. Available in ratings from 2400 v through 15 kv—50 through 500 mva interrupting and 2000 amp continuous.

NEW CONSTRUCTION ECONOMY TIP:

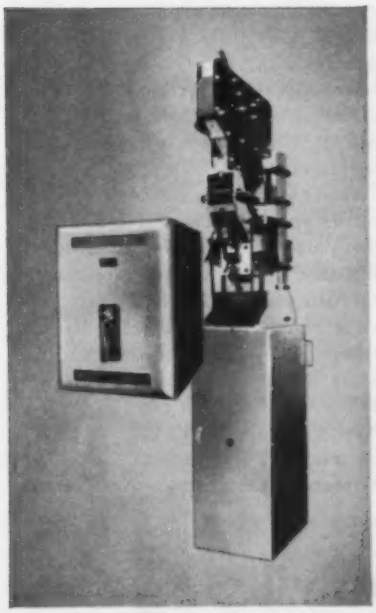
Isolated phase, metal-enclosed bus. For power generating stations. Available in ratings through 69 kv and 10,000 amp.

Nonsegregated phase, metal-enclosed bus. For switchgear connections. Available in ratings 600 v through 6000 amp; 5, 7.5 or 15 kv through 5000 amp.

Unit substations. I-T-E primary and secondary unit substations can be supplied for any application—indoor and outdoor—and in any standard rating.

Low voltage switchgear. For circuit protection. Commercial buildings, manufacturing plants, generating stations. Ratings through 600 v a-c, 250 v d-c, 6000 amp continuous, 15,000 through 150,000 amp interrupting.

BUY AN I-T-E "POWER PACKAGE"



Individual breakers. I-T-E large air circuit breakers are available in a wide range of types and ratings, 600 v a-c, 250 v d-c, 750 v d-c.

Coordinated engineering, delivery and installation means a better investment

An I-T-E "power package" includes the complete power handling facilities you need for a new construction project, building addition, or simple expansion of electrical service—one unit or a complete system for every application from generation to end use. You save many ways:

Sound planning. Talk with your local I-T-E application engineer about your general power requirements before you build. He'll work with you to determine the equipment needed to assure complete protection with greatest economy in total investment, operating costs, and construction time.

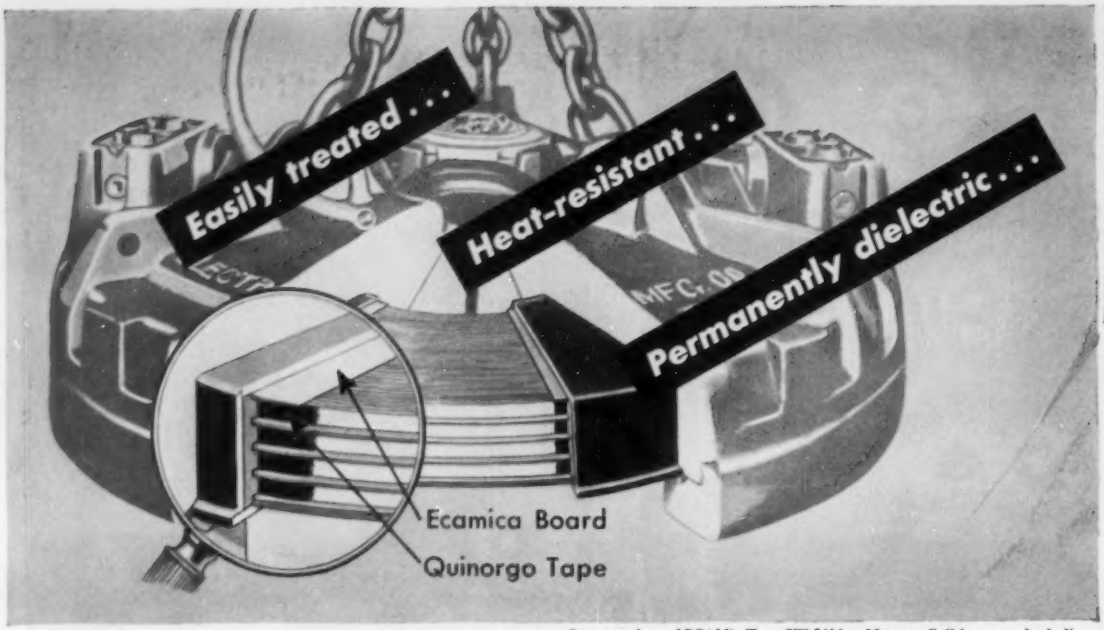
Easier installation. Before you begin construction, I-T-E will supply you with arrangement and channel base drawings. Equipment is factory assembled, tested and ready to install. Standardized frames and panel elements assure that future additions to your switchboard will match and line up.

Coordinated delivery. Shipments are made from I-T-E according to a predetermined schedule. Each part of the complete "power package" is delivered to the job when needed. This saves delays and eliminates inconveniences.

Assured performance. Since I-T-E will supply all equipment—pre-engineered—you are saved the work of coordinating equipment of different manufacture. You can be sure that the separate parts of an I-T-E "power package" will fit and function together.

For details, contact the I-T-E sales office nearest you—look in your classified directory under "Electric Equipment." I-T-E Circuit Breaker Company, 19th & Hamilton Sts., Phila. 30, Pa.

I-T-E CIRCUIT BREAKER COMPANY
Switchgear Division



Cutaway view of EC&M's Type SW Lifting Magnet: Coil layers and windings are protected with J-M Quinorgo and Quinorgobord base insulations.

3 important reasons

why both Quinorgo® and Quinorgobord® are used in EC&M magnets

Quinorgobord No. 1100 is impregnated and laminated by special EC&M processes into their ECAMICA Boards for coil layer insulation.

Quinorgo Tape No. 3000 is impregnated with compounds developed by EC&M and wet wound simultaneously with strap copper.

AFTER MANY TESTS of materials available, The Electric Controller & Mfg. Co., Cleveland, Ohio, selected both Johns-Manville Quinorgo and Quinorgobord, for use in their all-welded lifting magnets.

These materials provided the desirable and efficient mechanical and electrical properties needed for magnet duty. Each remains dielectrically stable under heat. Both are exceptionally free from magnetic particles and low in moisture content. Especially designed for treatment with other dielectrics, they are tough, relatively moisture-free, base materials.

No. 3000 Quinorgo Tape insulates the strap wound coils. Its excellent space factor permits a higher number of turns of copper, resulting in greater lifting power. By a special EC&M process, No. 1100 Quinorgobord (a board-like sheet) is treated and combined with Mica to form ECAMICA* board. This, they use between the coil layers.

Other leading manufacturers, processors and laminators also find that these moderate-priced J-M pyrolysis-resistant electrical insulations help cut costs, improve insulation performance and lengthen service life of equipment. For complete information, write for booklet EL-40A. Address Johns-Manville, Box 60, New York 16, N. Y. In Canada, 199 Bay Street, Toronto 1, Ontario.

Registered Trade Mark of Electric Controller & Mfg. Co.

Johns-Manville
ELECTRICAL INSULATIONS

. . . One leading public utility has a 4,500 psi, 1,150F double reheat cycle unit under construction. Another announced plans for a new supercritical pressure, steam electric station. The single-boiler-turbine-generator unit for this new station will operate at a higher steam temperature and pressure, and will have a capability greater than any installation thus far announced. Using supercritical pressure, and employing two stages of reheat, the new unit should be the most efficient plant thus far projected by the central station industry. The 6,000 psi steam generator will supply steam to the turbine at 5,000 psi, 1,200F. . . .

AS POWER PIPING BECOMES MORE CRITICAL

M. W. KELLOGG TESTING TECHNIQUES KEEP PACE

To meet the demand for more electric power, and to increase output with the least possible increase in fuel, the trend in utility steam power plants, as reported everywhere, is to higher temperatures and pressures. Thus steam piping—main and reheat—becomes even more critical than before.

One way in which The M. W. Kellogg Company, leading fabricator of power piping, keeps pace with increases in temperature, pressure, and capacity demands is in its testing techniques. Most recent Kellogg development is the company's "atomic camera". Activated by isotopes such as cobalt, iridium, and cesium, this powerful and portable device can photograph welded seams up to six inches thick in a single, short exposure. The same test by traditional X-ray equipment would take considerably longer.

The M. W. Kellogg Company was among the first to be permitted by the AEC to use isotopes of this magnitude. The atomic camera has already proved its value in the construction of many important public utility jobs. It is indicative of the Kellogg research and engineering which guard the vital link between steam power plant boilers and turbines.

M. W. KELLOGG'S "ATOMIC CAMERA"

FABRICATED PRODUCTS DIVISION
THE M. W. KELLOGG COMPANY, 225 BROADWAY, NEW YORK 7, N. Y.
The Canadian Kellogg Company, Ltd., Toronto · Kellogg International Corp., London
SUBSIDIARIES OF PULLMAN INCORPORATED

POWER PIPING—THE VITAL LINK

PROVED

on the job...

ANDERSON

Aluminum

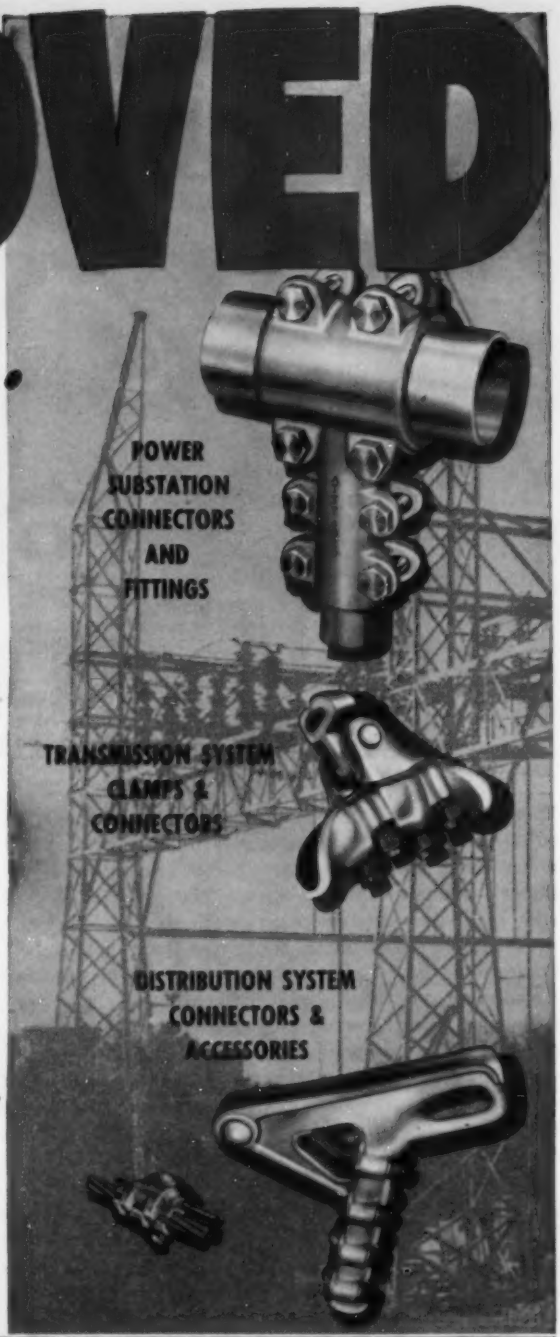
CONNECTORS, CLAMPS, FITTINGS & ACCESSORIES

- MAXIMUM EFFICIENCY
- LONGER LIFE
- EASIER INSTALLATION

Anderson cast aluminum electrical products are specially designed for *increased conductor life, minimum power loss, and easier handling.* Every safety factor has been carefully engineered into these superior electrical products . . . they're made to withstand extreme loading, sudden shock and stress reversals far in excess of established standards.

ABW DESIGN MEANS QUALITY *Plus* STRENGTH IN THE RIGHT PLACES

For complete information, consult one of our nearest 19 representatives . . . or contact our main office.


POWER SUBSTATION CONNECTORS AND FITTINGS
TRANSMISSION SYSTEM CLAMPS & CONNECTORS
DISTRIBUTION SYSTEM CONNECTORS & ACCESSORIES

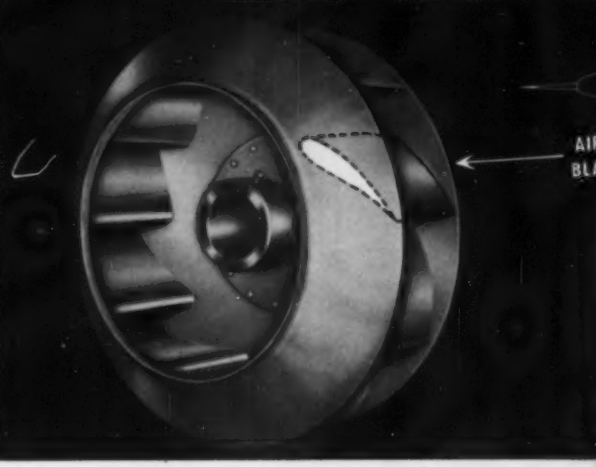
Aluminum and Bronze
POWER CONNECTORS • CLAMPS • FITTINGS and ACCESSORIES for
SUBSTATION — TRANSMISSION — DISTRIBUTION

ABW

ANDERSON BRASS WORKS
INCORPORATED
BIRMINGHAM 1, HOME OFFICE DEPARTMENT 2101 ALABAMA

Fact:

WESTINGHOUSE FANS WITH AIRFOIL BLADING REDUCE NOISE INTENSITY 65%



Westinghouse Airfoil Fans ideal for parallel operation

Sturtevant's application of the Airfoil principle to Centrifugal Fan wheel design not only reduces turbulence and resultant noise intensity ***. . . but also provides highest mechanical efficiency . . . up to 92%.*** It means that Westinghouse-Sturtevant Heavy-Duty Centrifugal Fans, with their smooth Airflow pattern, operate at lowest cost.

FACT: ***They are the most economical Centrifugal Fans you can select for power generation.***

1. Original Westinghouse Airfoil blading assures true, non-overloading horsepower. 2. Self-limiting horsepower characteristic reaches its maximum in normal range of selection. 3. Wheel proportions of Airfoil non-overloading fans facilitate direct connection to conventional squirrel cage induction motors.

The country's leading utilities have installed Westinghouse-Sturtevant Airfoil Mechanical Draft Fans to benefit from advanced design . . . lower operating costs . . . quieter operation.

MORE FACTS? Call your nearest Westinghouse-Sturtevant Sales Engineer . . . he's the "Man With The Facts" . . . or fill in the coupon below.

These and other leading Utilities have selected Westinghouse Airfoil Fans:

- Consolidated Edison, New York
- Duke Power Company
- Pennsylvania Electric Company
- Tennessee Valley Authority
- Southern California Edison Co.
- Philadelphia Electric Company
- Delaware Power & Light Company
- Cincinnati Gas & Electric Company
- Indiana-Kentucky Electric Corp.
- Ohio Valley Electric Corporation
- Duquesne Light Company
- New York State Electric & Gas Company
- Consumer Power Company
- Cleveland Electric Illuminating Co.
- Public Service Company of Indiana

WESTINGHOUSE AIR HANDLING

YOU CAN BE SURE...IF IT'S

Westinghouse

J-80429A

Westinghouse Electric Corp.
Sturtevant Division, Dept. 12B
Hyde Park, Boston 36, Mass.

Please send more information on your Airfoil Fans.

NAME AND TITLE .....

COMPANY .....

CITY ..... STATE .....

SHIELD YOUR EQUIPMENT FROM SHORT CIRCUITS OF INCREASING MAGNITUDE...

WITH EC&M (2200-5000 VOLT) MOTOR STARTERS

You don't have to be clote to a source of generation to have a serious fault. Transmission lines everywhere are increasing to match industry's growth, and your vital equipment is a vulnerable target unless fully protected.

EC&M provides a wide selection of Motor Starters to guard your vital drives from costly down-time, damage and repairs. They clear a faulted circuit quickly. After the cause of the fault has been removed, you can re-start in a matter of seconds with EC&M Motor Starters.

Note the 3 interrupting capacity ratings in the following table. This applies to both Oil and Air-Break Starters. Be sure you have the facts on this wide choice of EC&M Motor Starters for 2200-5000 volt motors.

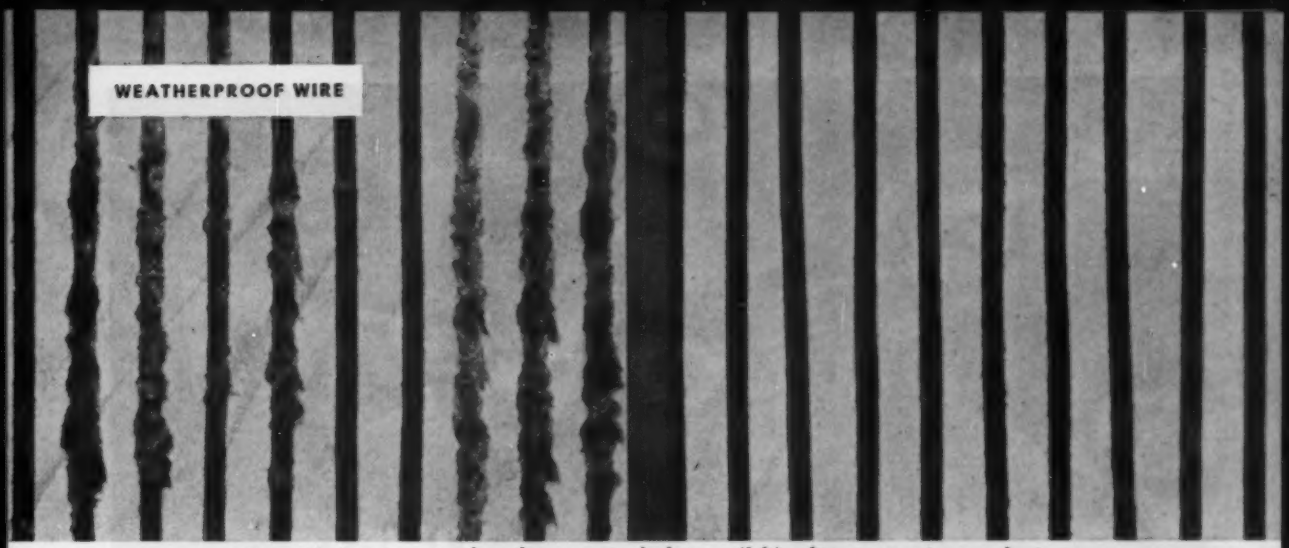
Write for new handy catalog 6062 showing complete coverage of 2200-5000 volt motors.

New EC&M type ZHA Air-Break Starters are CERTIFIED for 50,000 KVA interrupting capacity.

AN EASY WAY TO SELECT HIGH INTERRUPTING CAPACITY STARTERS				
50,000 KVA*	POWER FUSES		VALIMITOR	
2200-5000 volts	2300 volts	4800 volts	2300 volts	4800 volts
	150,000 kva	250,000 kva	unlimited kva bus	

*Certified

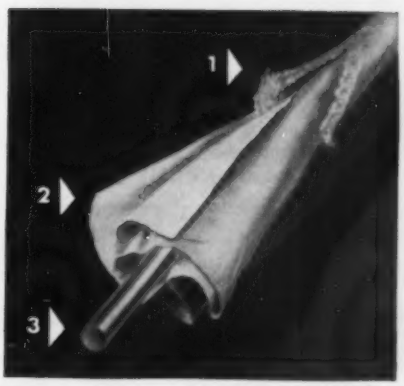
THE ELECTRIC CONTROLLER & MFG. CO.
2698 East 79th Street
Cleveland 4, Ohio



Unretouched photographs show that some standard types (left), after severe aging test, begin to come apart and festoon. Duraline (right), after similar severe aging, remains completely weathertight.

Anaconda's exposure rack at Hastings on Hudson, N. Y., used to study effects of *natural aging* on wire and cable coverings.

"Test of time" proves—you save money with Duraline



***Only Anaconda* makes Duraline. 1.** Outer braid, URC saturated and finished. Experience shows this covering gives best weather protection. **2.** Note *continuous* sheath of interlocked and felted, fibrous material. Water cannot "wick" through it. **3.** Copper, aluminum or copperweld conductor.

21 years on the torture rack and still no festooning

In 1934, hundreds of feet of Duraline* were installed on special outdoor racks at Anaconda's plant on the Hudson River.

In the 21 years since, this wire has been subjected to the most corrosive conditions possible: acrid smoke, salt mist, rain, scorching sun, ice and sleet.

Today this wire is as good as new. It shows absolutely no sign of deterioration . . . and what is more important, not the slightest sign of future festooning!

Duraline has passed the "Test of Time." Time has proved this weatherproof wire won't festoon . . . that it reduces grounds and shorts in wet, windy and icy weather. This trouble-free service saves money — enough to pay for Duraline over and over again. See your Anaconda Distributor or Salesman today. Anaconda Wire & Cable Company, 25 Broadway, New York 4, N. Y.

*Reg. U. S. Pat. Off.

DURALINE weatherproof line wire

ANACONDA®

THEY'RE PUNCTURE PROOF!

If it's on the pin, it's in service!

No more searching for defective insulators when your lines are protected with NEW Kimble *Tempered* Glass Insulators.

Why? Because these new insulators are puncture-proof. Exhaustive laboratory tests at values far in excess of A.I.E.E. standards have proved it impossible to puncture a Kimble *Tempered* Glass Insulator in air—*even under voltage impulses far above normal service rating*. Four years of field testing on more than 500 miles of line have produced no puncture failures. Even lightning surges have failed to damage these new Kimble *Tempered* Glass Insulators.

In the event of shattering due to severe mechanical shock, insulator disintegrates into small non-sharp fragments. Trouble shooters can locate broken insulator—fast.

What's the secret? *Tempering*, a Kimble development-in-glass that adds a new element to the many natural virtues of glass. It's an exclusive Kimble production method that gives Kimble insulators a hard-compression surface layer that makes them strong enough to meet the severe tests required.

Why not see how *tempered* glass can cut your line maintenance costs. Write for folder. Address: Kimble Glass Company, subsidiary of Owens-Illinois, Dept. EW-3, Toledo 1, Ohio.

KIMBLE INSULATORS
AN (O) PRODUCT

OWENS-ILLINOIS
GENERAL OFFICES • TOLEDO 1, OHIO

Here's why wire and cable jacketed with NEOPRENE give extra-long service

NEOPRENE RESISTS WEATHERING
Resists softening and deterioration from exposure to sunlight, weathering and temperature extremes.
NEOPRENE RESISTS ELECTROLYTIC ATTACK
Neoprene jackets have sufficient insulation resistance to prevent corrosion from electrolytic action.
NEOPRENE IS RESILIENT
Excellent resistance to flex cracking, abrasion, chipping, cutting.
NEOPRENE RESISTS OIL AND GREASE
You can soap neoprene for "pulls" without harming it. Exposure to chemicals and solvents has little effect.
NEOPRENE RESISTS OZONE, CORONA CUTTING
It resists both causes of jacket failure equally well.
NEOPRENE WON'T SUPPORT COMBUSTION
Maximum safety in mines and danger areas where flame propagation is a serious hazard.
NEOPRENE RESISTS AGING
Resilient neoprene stays flexible through long years of service.

OVER 20 YEARS of successful field experience in all kinds of rubber products—that's one reason why you can count on long, dependable service from neoprene-jacketed wire and cable. A study of neoprene's remarkable properties will tell you why it outlasts ordinary jacketing materials . . . why specifying neoprene-jacketed wire and cable can mean significant savings in your replacement and maintenance costs. For full details about neoprene-jacketed wire and cable, get in touch with your wire and cable supplier.

NEOPRENE

The rubber made by Du Pont since 1932

DU PONT

BETTER THINGS FOR BETTER LIVING . . . THROUGH CHEMISTRY

MAIL THIS COUPON TODAY!

FREE! THE NEOPRENE NOTEBOOK. Every issue contains interesting stories about products made with neoprene. Actual case histories give you the facts about neoprene's longer service life. Clip this coupon to get on the mailing list.

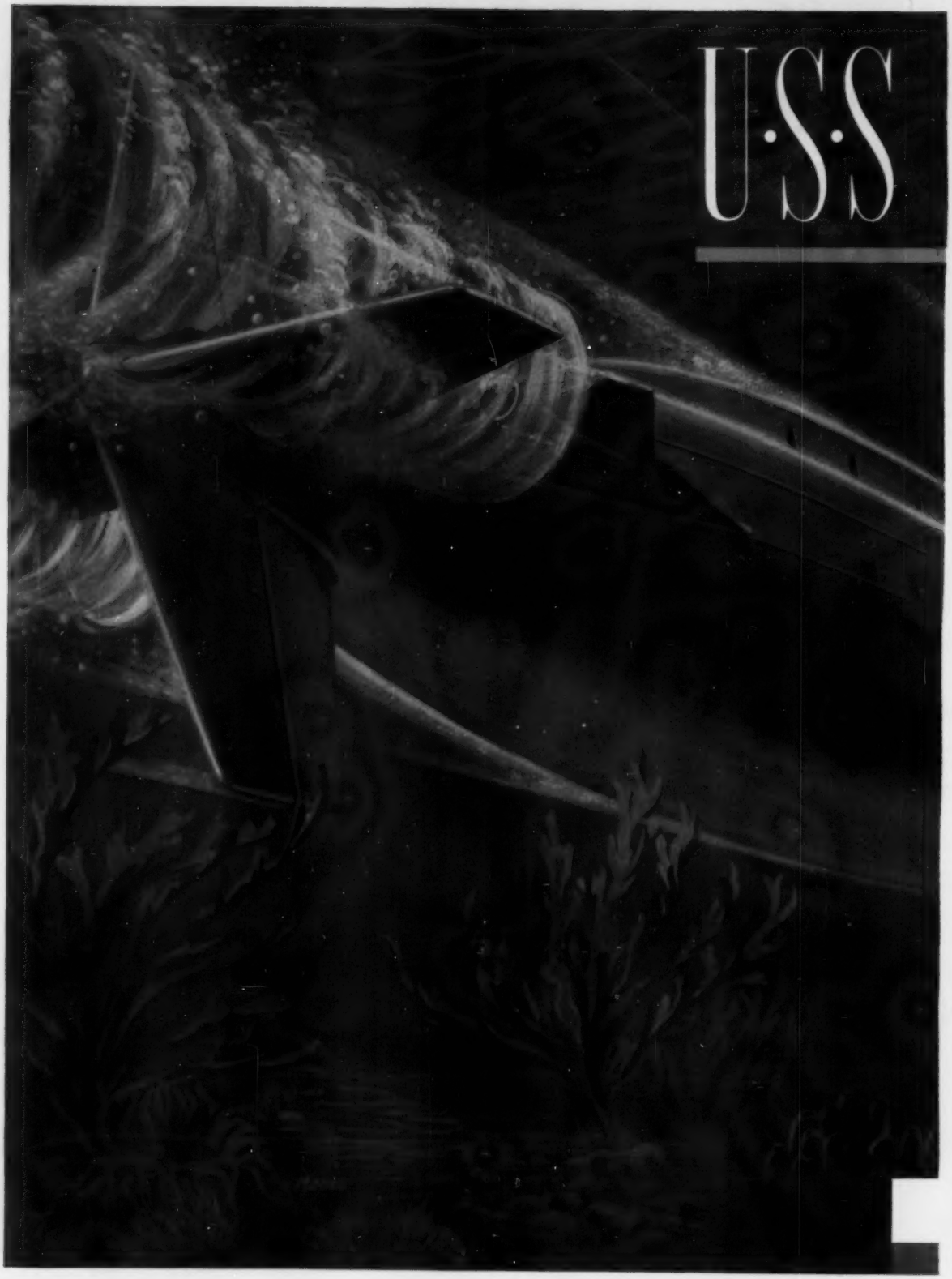
E. I. du Pont de Nemours & Co. (Inc.)
Rubber Chemicals Div. EW-3
Wilmington 98, Delaware

*Name*_____ *Position*_____

*Firm*_____

*Address*_____

*City*_____ *State*_____


U·S·S

Nautilus

first
atomic submarine
uses

TIGER BRAND ELECTRICAL CABLE

The Nautilus was built by General Dynamic Corporation's Electric Boat Division shipyard, at Groton, Conn. She was launched on January 21, 1954.

Very frankly, we cannot recall a more *critical* application of electrical cable than this new atomic-powered submarine. And from one end to the other, this amazing boat is laced with Tiger Brand Electrical Cable.

But here's the important thing—*you* can get the same quality that went into the Nautilus. Just call your American Steel & Wire salesman.

AMERICAN STEEL & WIRE DIVISION, UNITED STATES STEEL
GENERAL OFFICES: CLEVELAND, OHIO

COLUMBIA-GENEVA STEEL DIVISION, SAN FRANCISCO, PACIFIC COAST DISTRIBUTORS
TENNESSEE COAL & IRON DIVISION, FAIRFIELD, ALA., SOUTHERN DISTRIBUTORS
UNITED STATES STEEL EXPORT COMPANY, NEW YORK

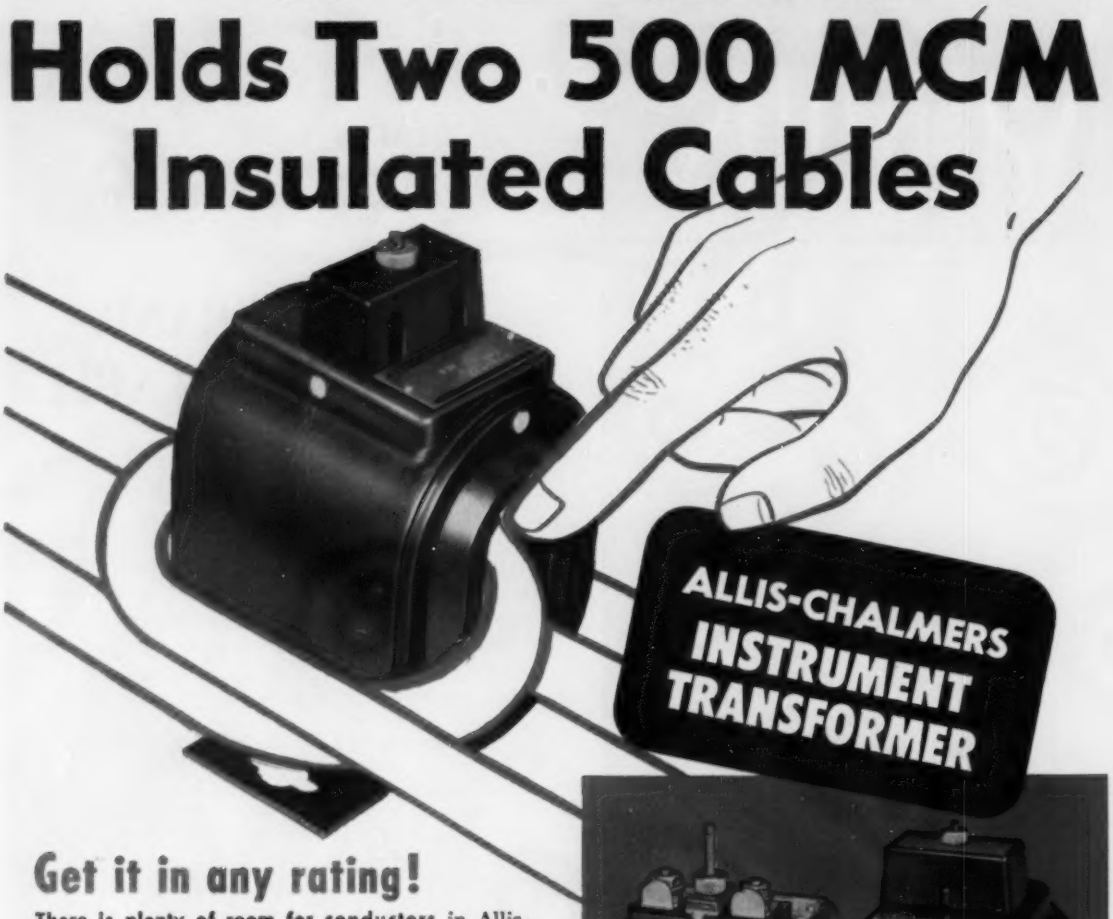
A STANDARD TIGER BRAND CABLE FOR EVERY SPECIAL JOB!

paper & varnished cambric cable
asbestos wire and cable
shovel & dredge cable
mold cured portable cord
machine tool & building wire
special purpose wire & cable
aerial, underground & submarine cable

USS Tiger Brand **ELECTRICAL WIRE & CABLE** USS

UNITED STATES STEEL

This Oval Window Holds Two 500 MCM Insulated Cables



Get it in any rating!

There is plenty of room for conductors in Allis-Chalmers 600-volt outdoor-indoor current transformers. Every rating has this same big oval window 1⅜ by 2¾ inches — large enough to hold two 500 MCM stranded conductors with 600-volt insulation.

In addition, units are compact and lightweight. Install them singly or in multiple, in standard instrument transformer enclosures or outdoors. You can mount them in any position — they have special provision for different methods of mounting. It is possible to get a number of ratings from a single unit by passing primary conductor through window more than once. Type TWM transformers come in the following ratings: 200 to 5 amp, 400 to 5 amp, 600 to 5 amp, and 800 to 5 amp.

Get all the facts. Ask your nearby A-C office for a copy of 61B8080 or write Allis-Chalmers, Milwaukee 1, Wisconsin. A-4546

Short-circuiting device on terminal block in open-circuited position.

Cover will fit over terminal block only if straps are turned in proper position.

Removable Short-Circuiting Device... Can be Added to Units in Service

A useful operating option has been added to Allis-Chalmers thru-type current transformers. A short-circuiting device fits the secondary terminal block: with straps turned to short-circuiting position, cover cannot be replaced. Device is supplied on all units, can easily be removed if desired. It is readily adaptable to any transformer in service.

A-C

ALLIS-CHALMERS

PUTTING THE *PLUS* IN MICA

. . to produce the perfect insulating product

MACALLEN MICA

There's nothing synthetic in what happens when MACALLEN and Mica get together. Just nature's perfect insulation made practicably usable, uniform and efficient, profitably applicable to the insulating problems of the electrical-industrial engineer-producer. It's mica magic — PLUS!

THE MACALLEN COMPANY

BAY ROAD, NEWMARKET, NEW HAMPSHIRE

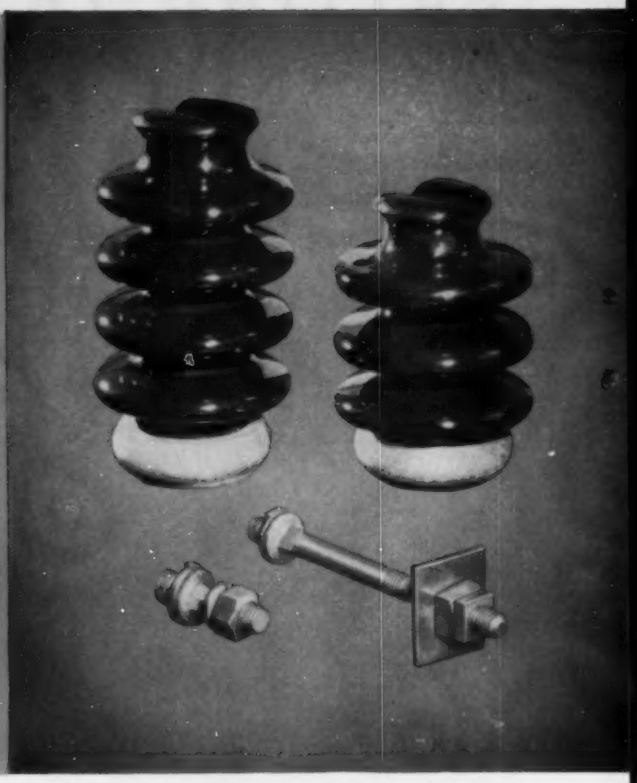
when you think of MICA . . . think of MACALLEN

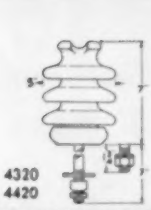
MACALLEN MICA

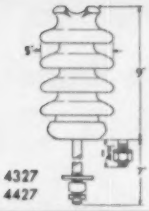
ALL FORMS • ALL QUANTITIES • ALL DEPENDABLE

CHICAGO: 565 W. WASHINGTON BOULEVARD • CLEVELAND: 1231 SUPERIOR AVENUE

LAPP DISTRIBUTION POST INSULATORS







CATALOG NUMBER — Short stud unit / Long stud unit	4320 / 4420	4327 / 4427
DIMENSIONS		
Leakage Distance, inches	11	15
Dry Arcing Distance, inches	5.75	7.6
MECHANICAL VALUES		
Cantilever Strength, pounds	1500	1500
ELECTRICAL VALUES		
Recommended Line Voltage, Kv	20	27
Low Frequency Dry Flashover, Kv	80	95
Low Frequency Wet Flashover, Kv	55	65
Impulse Flashover—Positive, Kv	105	135
Impulse Flashover—Negative, Kv	130	190
RADIO INTERFERENCE		
Test Voltage Rms to Ground, Kv	15	15
Max. RIV, Microvolts at 1,000 Kc	100	50
PACKING AND SHIPPING		
Net Weight, each, pounds	7.7	9.5

. . . trouble-free insulation for lines operating at voltages up to 25 Kv

NOW all the operating security of the famous Lapp Line Post insulator for transmission duty is available in a new series of Lapp Post insulators for distribution use—at voltages up to 25 Kv.

SOLID ONE-PIECE PORCELAIN. The body is a solid porcelain without internal hole, machined all over including conductor and tie wire grooves. Base is externally attached and studs are interchangeable—any required length being available.

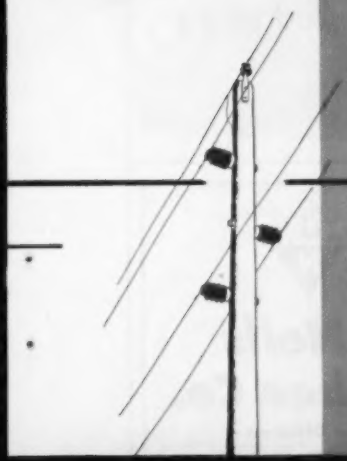
FOG-TYPE. Multiple short petticoats, characteristic of Lapp Fog-Type design, provide an exposed uniform leakage path and self-cleaning feature—most efficient for duty in contaminated atmosphere.

LIGHTNING- AND MECHANICAL-ATTACK RESISTANT. Short sturdy petticoats—such as have been proved by nearly 25 years of service on Lapp Line Posts—provide greatest protection from damage by arcover and attack by stones or bullets.

NO CRACKING. The porcelain, held in the large-area low-intensity grip of its cemented-on base, can be loaded only in compression. No internal bursting forces can develop—permanently free from cracking.

PUNCTURE-PROOF. Solid electrical porcelain from conductor to base—no internal conductive pins, or even air space. Completely puncture proof.

RADIO-FREE. The Lapp Post design is inherently free from radio interference—requires no treatment or coatings. Dependably and permanently free from radio or television interference.



A *BETTER* DISTRIBUTION LINE AT *LOWER* COST...

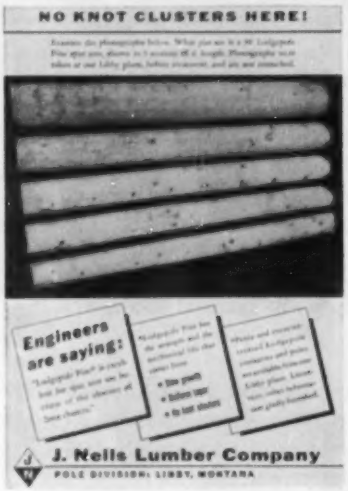
MOUNT LAPP POSTS *HORIZONTALLY*

You can eliminate cross-arms, braces, brackets and other hardware, by horizontal mounting of Lapp Distribution Posts. Such a line is trim and neat, and the insulators have even better electrical characteristics than when mounted vertically. (Several companies have used such a construction with regular Lapp Line Posts for periods up to 20 years—and they report that these lines have the best operating records of any lines on their systems!)

Lapp Insulator Co., Inc., Le Roy, N. Y.

Lapp

These advertisements in miniature are by way of reminding you again of a big important fact . . .



J. Neils Treated "Double Life" Transmission Poles and Spar Arms are the standard of value in the utility industry. . . . Write for illustrated folder and information on the application of J. Neils "Double Life" treated poles to your specific requirements.

1 product Treated "Double Life" Larch Poles
2 made by J. Neils Lumber Co.
3 purpose Transmission Use
4 customer One of America's Largest Utilities
5 reasons purchased Long Life....Low Maintenance
J. Neils Lumber Company

Engineers are saying:
"Lodgepole Pine" appears to be much more ideal for round pole timber application than anything we have tried so far."
Lodgepole Pine has:
Small knots—no clusters
Strength—slow growth
Uniform taper
J. Neils Lumber Company

J N

J. Neils Lumber Co.

Pole Division
Libby, Montana

★ WESTERN LARCH
★ LODGEPOLE PINE
★ DOUGLAS FIR

New positive-action LODRUPTER

on

HI-PRESSURE CONTACT SWITCHES

LODRUPTER shown here on Side Break Type A6 Switch 15 Kv

LODRUPTERS are supplied on Side Break, Vertical Break and Hook Operated Switches

Ratings

Single Break Vertical or Side Opening, and Hook Operated			Double Break Side Opening		
Nom. Kv.	Cont.	Interr.	Nom. Kv.	Cont.	Interr.
7.5	400 Amp. 600 Amp.	400 Amp. 600 Amp.	23	600 Amp.	600 Amp.
15	400 Amp. 600 Amp.	400 Amp. 600 Amp.	34.5	600 Amp.	600 Amp.

Now you can BREAK FULL LOAD CURRENTS *with the reliable*

R&IE Hi-Pressure Contact Switches

One More step in the progress of interrupting devices on R&IE Switches.

Again the usefulness of R&IE Switches has been greatly increased. ***Now*** you can break full load currents of lines, capacitors, transformers, and parallel loads. You can also interrupt magnetizing currents of transformers or lines.

The Lodrupter has been designed so that there is no external arcing during interruption. It operates as easily as any conventional disconnecting switch.

A High Quality Switch for Load Interruption

The positive-action, high speed "Lodrupter" attachment functions independently—regardless of switch operating speed. It carries current directly from the switch to the interrupter chamber, not through any links, pins, or toggles. The Type A6 Switch shown above features Sealed Pressure Contact at hinge and jaw swivels, Hi-Pressure break contact with proper momentary rating, and four-bolt universal terminal clamps.

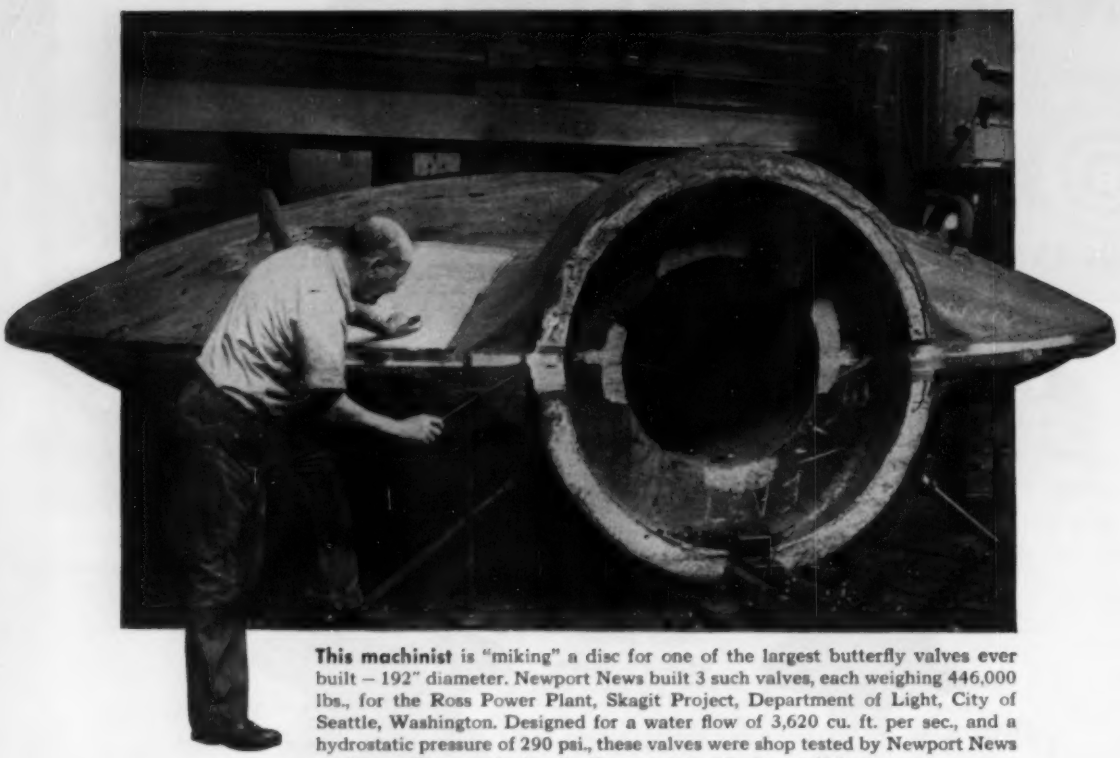
R&IE EQUIPMENT DIVISION

I-T-E CIRCUIT BREAKER CO.

GREENSBURG, PA.

STRUCTURES—steel • aluminum • TESTING DEVICES • KIRK KEY INTERLOCK SYSTEMS • ISOLATED PHASE STRUCTURES • INTERRUPTER SWITCHES

INDOOR BUS SUPPORTS and BUS FABRICATION • OUTDOOR BUS SUPPORTS and AIR SWITCHES • SUBSTATION



This machinist is "miking" a disc for one of the largest butterfly valves ever built – 192" diameter. Newport News built 3 such valves, each weighing 446,000 lbs., for the Ross Power Plant, Skagit Project, Department of Light, City of Seattle, Washington. Designed for a water flow of 3,620 cu. ft. per sec., and a hydrostatic pressure of 290 psi., these valves were shop tested by Newport News at 450 psi. They are hydraulically operated with oil at 1,500 psi. pressure.

Birth of a **200-ton** Butterfly

This disc for a 16-foot butterfly valve reflects two basic advantages of Newport News fabrication...

First, it exemplifies the *careful attention* Newport News craftsmen give to every detail. And secondly, it attests to the *quality* with which Newport News produces in massive equipment for public utilities and allied industries...due to Newport News' high integration of skill and production facilities.

Additional advantages accrue to customers from extensive work conducted in Newport News' testing laboratories on problems related to water power equipment.

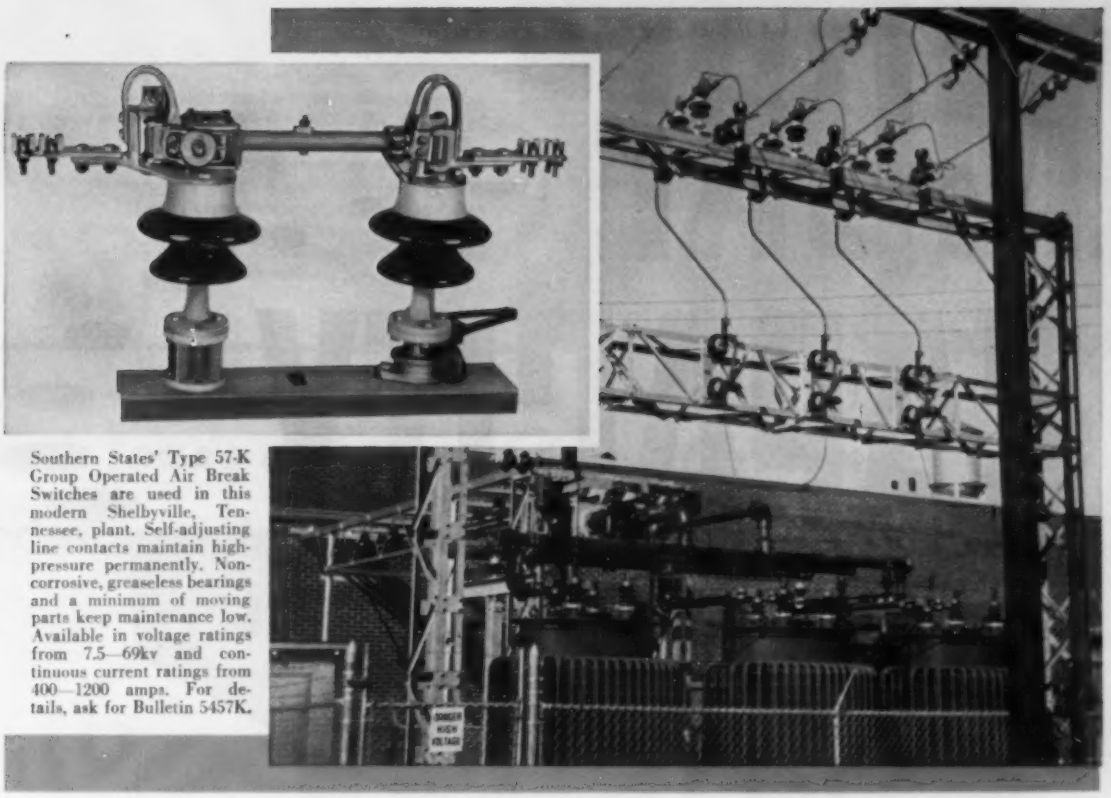
Avail yourself of the engineering talent, along with the specialized production techniques and the skill of Newport News craftsmen operating vast steel fabricating shops, five huge machine shops, drop forging and die facilities along with acres of brass, iron and steel foundries.

Let us bid on equipment for your present or future projects. If you are not familiar with the way Newport News can help you, write for our illustrated booklet entitled "Water Power Equipment" ...it's yours for the asking.

NEWPORT NEWS

Shipbuilding and Dry Dock Company

Newport News, Virginia



Southern States' Type 57-K Group Operated Air Break Switches are used in this modern Shelbyville, Tennessee, plant. Self-adjusting line contacts maintain high-pressure permanently. Non-corrosive, greaseless bearings and a minimum of moving parts keep maintenance low. Available in voltage ratings from 7.5—69kv and continuous current ratings from 400—1200 amps. For details, ask for Bulletin 5457K.

GOODYEAR IS GOOD EXAMPLE OF HOW NATION'S INDUSTRIES USE SOUTHERN STATES EQUIPMENT

Increased use of power by the nation's expanding industries is calling for more substations and switchyards. Southern States is ideally equipped to handle these applications to the complete satisfaction of industries and suppliers of power alike.

A Shelbyville Power System industrial substation at the Goodyear Rubber Plant in Shelbyville, Tennessee, is a good example. Southern States supplied the substation and many components: the type 57-K Group Operated Air Break Switches for disconnecting incoming 15 kv lines; B Series Power Fuses to protect the transformers; connectors and bus fittings which accommodate conductors carrying up to 3500 amps; and heavy-duty, hookstick operated disconnects that provide a means for isolating the station from the plant.

Industries, as well as the nation's leading utilities, look to Southern States for top-quality, functional equipment. It will pay you to specify products made by Southern States.

SOUTHERN STATES EQUIPMENT CORP.
HAMPTON, GEORGIA

IN CANADA: Dominion Cutout Co., Ltd., Toronto

MORE CAPACITY

Chase® Bus Conductors carry 20% more load!

Those ventilating holes in Chase Ventilated Square Tube Copper Bus Conductor help dissipate heat... and increase current-carrying capacity up to *20%*. And ventilated square tube bus conductor can *also* save you as much as *36%* in weight of copper as compared to flat rectangular bus bars!

Because of its rugged, square cross section configuration, Chase Bus Conductor is much stronger. It withstands the tremendous stress of heavy short circuits, permits longer spans between supports.

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Charlotte†	Denver	Kansas City, Mo.	New Orleans	Rochester†	(†sales office only)

Mr. James Lohr, Plant Superintendent (right), and Standard lubrication specialist, John Pirtle, inspect new 68,000 kw. generator. Initial fill of 3,905 gallons of NONPAREIL Turbine Oil was made on start-up date, December 7, 1953. A graduate engineer from Rose Polytechnic Institute, John has also completed Standard's Sales Engineering School. Customers of John's find his background and experience pay off *for them.*

Peak loads call for peak performance

Indianapolis Power & Light Uses NONPAREIL TURBINE OIL

Five turbines now operating at Indianapolis Power & Light Company's White River generating plant provide the bulk of the utility's more than two billion Kwh. annual production. The units have been using Standard's NONPAREIL Turbine Oil since their start-up dates. James Lohr, Plant Superintendent of the White River Plant gives these reasons why he likes NONPAREIL as the lubricant:

(1) NONPAREIL Turbine Oil is guaranteed for the life of the turbine.

(2) Periodic examination of the oil by Standard Oil laboratories for maintenance of quality.

(3) Using NONPAREIL means turbines are serviced with highest quality lubricant.

(4) NONPAREIL Turbine Oil has always done an excellent job.

NONPAREIL Turbine Oil is used in more than 800 turbines in the midwest—some for more than 25 years. While Indianapolis Power & Light Company's daily output is now about 7 million Kwh., generators have never been shut down because of lubrication failure. Neutralization number of NONPAREIL in the utility's generators is guaranteed never to exceed 0.15 mg. KOH/g. Regular analysis by Standard Oil laboratory assures acidity will be kept far below that, usually 0.03.

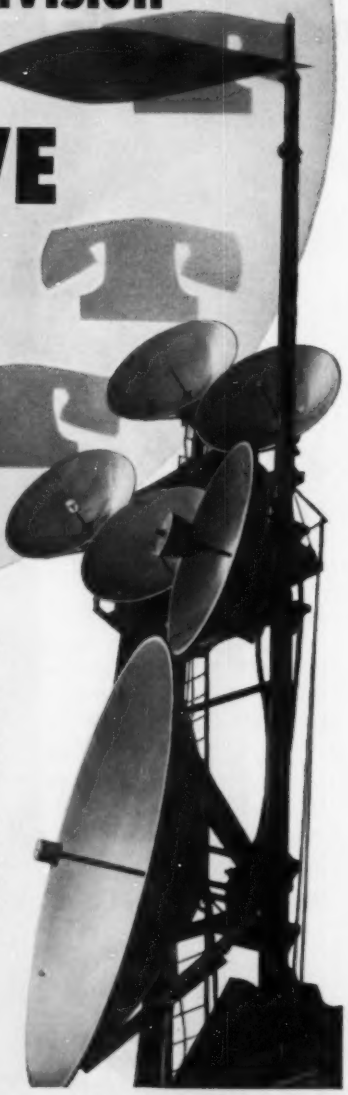
You may wish to know more about NONPAREIL Turbine Oil. In the midwest your nearby Standard Oil lubrication specialist will be happy to provide it. Or contact—Standard Oil Company, 910 South Michigan Avenue, Chicago 80, Illinois.

STANDARD OIL COMPANY
(Indiana)

STANDARD

Pulse Position Time Division

MICROWAVE



First Successful Method of Multiple Channel Communication in 25 Years

YES, of all methods tried, only Pulse Position Time Division systems yield all the objectives desired in multiplex equipment. Inherently, it sets new standards for reliability . . . economy . . . and loading. Widespread military usage has proved this. And, wherever it has been applied to industrial installations, equal success . . . equal preference has resulted. Recognize the advantages of being able to: Use elementary RF equipment . . . obtain direct crystal control of RF . . . apply modern and high speed visual servicing . . . have up to twenty-four fully-loaded channels free from cross talk . . . work with totally independent channel adjustment . . . and gain multiple repeats plus exceptional performance!

Today, there are 50,000 channel miles of this perfected G-E microwave in use. Take note of this wide experience. Let G. E. recommend the equipment to serve you best. *Sec. X1935-21, General Electric Company, Electronics Park, Syracuse, N. Y.*

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Increase conductivity and protect your connections with BLACKBURN's

Contax

Available in ½ lb. tubes and pint, quart and gallon cans.

Metallic particles in Contax break through oxide films, lowering interstrand and joint resistance. Low resistance connections remain cooler, and last longer.

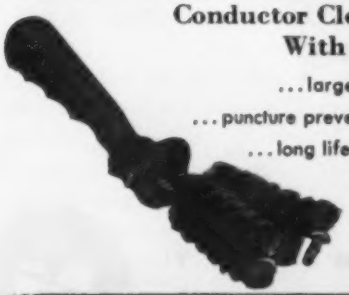
High temperature stability, ASTM drop point of 380° F, insures lasting performance under severe operating conditions.

Contax is weather-resistant and seals out air and moisture to eliminate corrosion.

Contax is stable—will hold metallic particles in suspension indefinitely.

Extra heavy duty lead tube will not crack with flexing.

Conductor Cleaning Brush With Glove Guard



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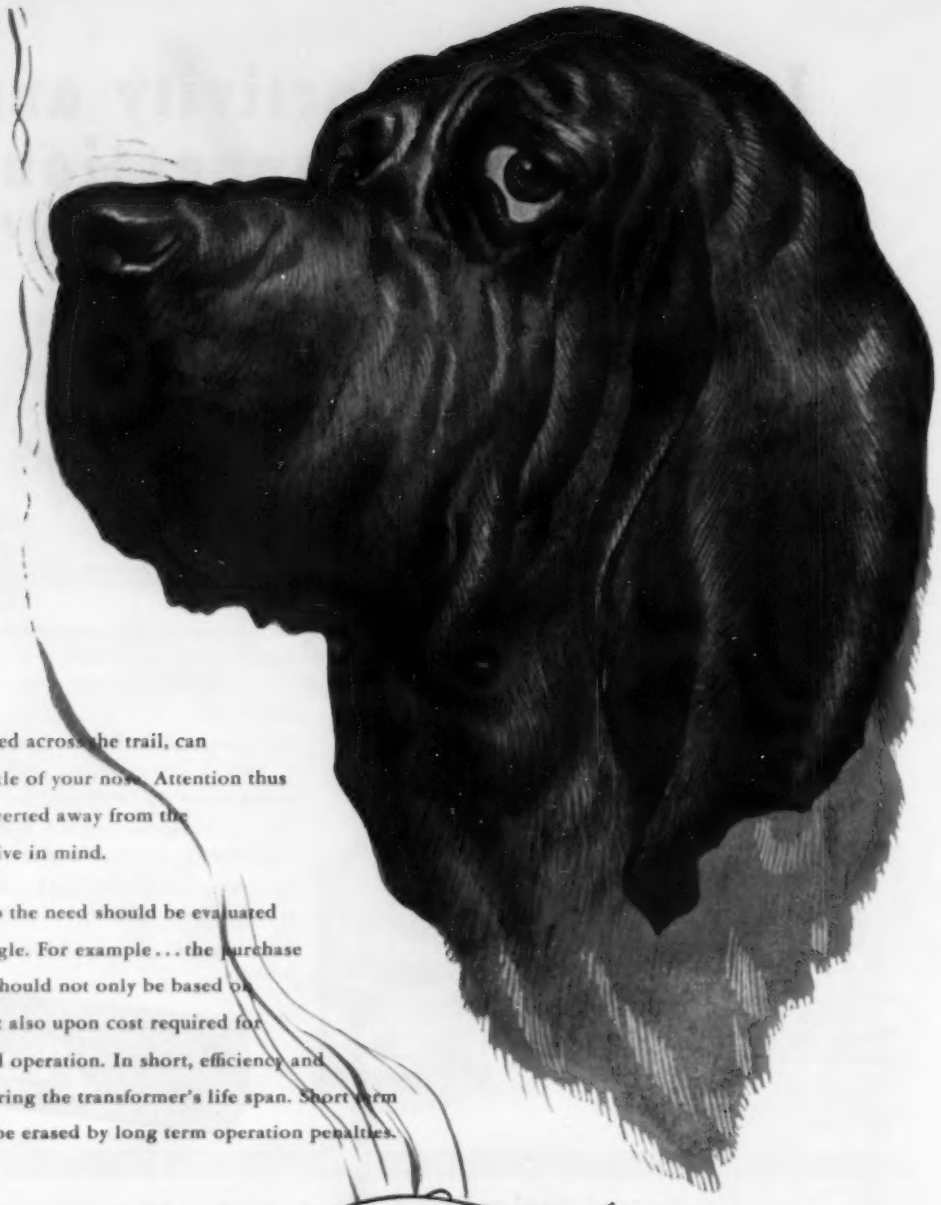


A herring, dragged across the trail, can change the wrinkle of your nose. Attention thus gained can be diverted away from the important objective in mind.

Facts pertinent to the need should be evaluated ... from every angle. For example ... the purchase of transformers should not only be based on initial cost ... but also upon cost required for maintainence and operation. In short, efficiency and dependability during the transformer's life span. Short term gains can easily be erased by long term operation penalties.

ARE YOU...CHASING A HERRING?

Check your purchases ... know *what* you are getting *before* you buy in addition to its cost. And ... if you specify Moloney ... you will be buying "dependability at its best!"

WE59-19

MOLONEY ELECTRIC COMPANY

Power Transformers • Distribution Transformers • Step Voltage Regulators • Regulating Transformers Load Tap Changing Transformers • Load Center Transformers • Unit Substations • Network Transformers • Constant Current Transformers • Capacitors • Transformers For Electronics

SALES OFFICES IN ALL PRINCIPAL CITIES • FACTORIES AT ST. LOUIS 20, MO. AND TORONTO, ONT., CANADA

"Step Up the Drive in '55– The Year of Greatest Opportunity"

That's the theme of the annual Edison Electric Institute Sales Conference which gets underway in Chicago next Monday. To us this is more than a slogan. It is a way of life.

Electrical World has long been convinced that a sustained and vigorous selling program is the cornerstone for continued expansion and prosperity of the electric utility industry. Our "Sell —and Sell—and Sell" editorial campaign of past years was among the most successful and rewarding we have conducted.

This year as our special salute to the EEI Sales Conference and to the industry's individual salesmen, from presidents to the men with the sales kits, we offer a 12-page editorial feature (p 115) that points the way to one of the richest load-building markets on the horizon. That market is commercial cooking.

Here is a subject in keeping with the sales conference theme, for the present state of commercial cooking sales is a wide open bid to "Step Up the Drive in '55." Its promising future makes it well worth your time and effort in this "Year of Greatest Opportunity."

You'll find no dull, detailed presentation of study results in this editorial feature. In it we've captured some of the spirit of the hard-hitting, fast-paced sales campaign. This enthusiasm comes from the 40-odd companies studied which have profitably ventured into this rich field and consented to contribute some of their end-of-the-rainbow experiences for the future prosperity of the whole industry.

One of the really striking features uncovered by the study is the relatively small number of utilities which are exploiting a market that is no farther away than their favorite restaurants. It appears in some ways to be another situation in which the obvious has been overlooked.

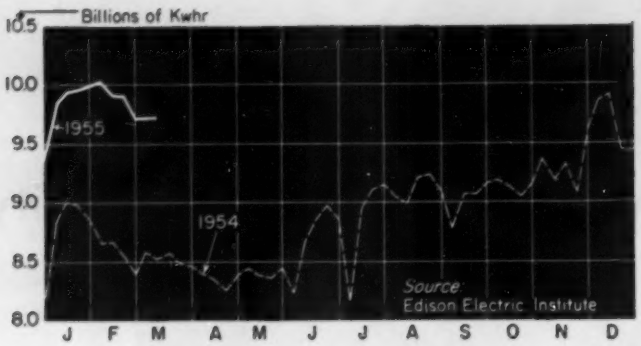
Certainly it can't be competition which is scaring the electric cooking salesmen away from the kitchens. Even in the heart of the gas producing country, where fuel prices are lowest, sales efforts have paid off. Those restauranteurs who have bought electric cooking equipment testify to its superior features. They are among the best prospects for more sales.

The exact causes of the present state of commercial cooking promotion are not particularly important for our purposes. What is important is that you start "putting chef's hats on kilowatts" just as rapidly as possible.

There are, of course, other rich fields bidding for the electric utility sales effort during this year. The outstanding program of speakers lined up for the annual sales conference will cover them thoroughly.

But in this "year of opportunity", you'll be hard put to find a better bet than commercial cooking. It's a line that is crying for a stepped-up drive.

THE ELECTRICAL WEEK



OUTPUT

Week Ended Mar. 12

9,726,000,000 Kwhr

Up 14.2%

Per Cent Change from Previous Year

	Total US	New Eng.	Mid. Atlan.	Cent. Ind.	West Cent.	South-east	South Cent.	Rocky Mount.	Pacific NW	Pacific SW
Mar. 12	+14.2	+9.6	+8.1	+13.2	+6.2	+25.9	+11.9	+12.5	+14.7	+6.1
Mar. 5	+13.3	+10.2	+6.9	+13.6	+6.9	+18.9	+11.8	+12.8	+16.8	+11.6
Feb. 26	+15.8	+10.3	+9.5	+13.7	+9.3	+26.8	+10.0	+17.1	+13.4	+16.8

Seasonally Adjusted Index 183.5 Week Ago 183.0 Year Ago 160.3

The Issue's News Highlights . . . Hoover Commission issues lending agencies report recommending abolition of Rural Electrification Administration . . . Westinghouse's President Price asks Senate Finance Committee for complete embargo on imports of electrical equipment . . . Rep Clare Engle of California launches Democratic attack on Administration's partnership power policy by criticizing Budget Director Hughes' role in fostering its concept.

Westinghouse has announced new price policy for heavy electrical equipment effective midnight March 15. New policy is based on formula taking into account changes in monthly cost of material and labor as reported by BLS. Under the formula portion of contract represented by materials is figured at 35%, and by labor, 55%. F. D. Weatherholt, sales manager of apparatus products, says new policy is in line with recommendations from various Westinghouse buyers and buyer groups.

Bonneville Power Administration has warned interruptible power customers in Spokane area of possible cutbacks in deliveries starting this week. BPA Spokane area Manager Paul H. Williams blames recent cold weather for cut in stream flow . . . Idaho Power will build $3 million, 230-kv line from Baker to La Grande, Ore., to connect system with Northwest power pool. Company has also signed 20-year agreement with BPA for exchange of surplus power in time of need.

Labor: Southern California Edison and UWUA-CIO agree on across-the-board wage increase of 3% or 5¢ an hour, whichever is greater, retroactive to Jan. 1. Same agreement was reached with IBEW-AFL Feb. 9.

NEMA: Pres A. F. Metz announced admission of seven new firms, bringing membership to 571. Two of seven, Kaiser Aluminum & Chemical and Rea Magnet Wire, joined NEMA's wire and cable section, bringing that membership to 39. These 39 firms sold $1 billion of insulated wire and cable in 1954. The NEMA 50-year certificate in recognition of half a century of service in the electrical industry has been awarded to S. Wyman Rolph, retired president, Electric Storage Battery.

The five New York utilities are distributing booklet, "The People Want," recording statements, resolutions, and editorials of labor, farm, business, industrial, civic, and other groups, and newspapers, in favor of business development of Niagara power . . . Vermont legislature is considering bill to set up state power authority with power to construct transmission facilities, and atomic reactor plants. It would be known as Vermont Energy Corporation.

NEWS OF THE INDUSTRY BRIEFLY TOLD

Off the Washington Wire . . . Interior Secretary Douglas McKay has told Congress a revision of cost studies for Fryingpan-Arkansas Project has cut $16.3 million from original estimate of $172.9 million . . . REA Administrator Ancher Nelsen says Hoover Commission "oversimplified" when it recommended drastic reorganization of agency (also see p 102) . . . Senate and House Interior Committee members will fly over Hells Canyon site before holding hearings locally in week or two . . . AEC has cleared ten top-level insurance executives to study hazards of private atomic power plants . . . Senate Agricultural Committee is delaying its report on repeal of state allotment formula until NRECA testifies . . . In updating their studies of Missouri River Basin water and power, Reclamation Bureau and Corps of Engineers are expected to recommend boost in generating capacity by some 200,000 kw . . . President Eisenhower has nominated Allen Whitfield, Des Moines attorney, as fifth member of AEC to replace Joseph Campbell . . . House Appropriations Committee has voted $400,000 to continue until end of year interim contracts under which Southwestern Power Administration buys power from co-ops.

General Electric this week is telling utilities and distributors about its two new small model heat pumps which in terms of heating capacity mean installed price reductions ranging up to 30% to consumers. Average price saving is between 10 to 15%. The new packaged heat pumps have improved cooling performance, and heating capacities are increased by 36 to 60% over former models.

Atomic Power: Detroit Edison told Michigan PSC last week it hopes to start building $45-million atomic power plant in about two years. Two sites are under consideration for the 100,000-kw "breeder" type of unit: Harbor Beach on Lake Huron, and Monroe on Lake Erie. Project would be joint venture of Atomic Power Development Associates, the 33-company group of which Detroit Edison is member.

Arkansas PSC has authorized construction of Mississippi Valley Generating's power plant at West Memphis . . . Electric utilities report to SEC they expect to spend about same amount this year as in 1954 for expansion. All utilities plan $4,384-million expenditure in 1955 compared with $4,219 million in 1954 . . . AEC has approved reactor study project by Seminole Electric Co-op, and five other co-ops. Fairbanks Morse will assist group with technical advice.

ABOUT PEOPLE IN THE INDUSTRY

Joseph A. Fisher, president of UWUA-CIO, and his executive board agreed in Miami meeting ending last week to set up a committee to explore possibility of merging with IBEW-AFL. IBEW's Pres J. Scott Milne says proposal is "good news" and that he will be happy to meet with UWUA. UWUA has 80,000 membership in electric, gas, and water utilities. IBEW claims "three times" this figure in utilities (including telephone). AFL union also covers non-utility fields—a possible bar to merger.

Most persistent opposition to the MVGC contract has come from "out-and-out advocates of government ownership and government operation of electric power facilities," Pres Edgar H. Dixon of Middle South Utilities told N. Y. Security Analysts last week. "It seems to me to be clear beyond any doubt," he added, "that a dangerous precedent would be set in our country if this minority opposition group were to succeed in upsetting a sound business contract which has had all necessary government approvals."

More News About People page 210

Representative Holifield disclaims any association with report. He says "commission report is so faulty in concept and method that I must object to it. . ."

Paul Grady of Price Waterhouse & Co headed the study group which prepared report the Hoover Commission based its recommendations on federal lending agencies

Hoover Unit Urges Abolition of REA

The Hoover Commission has issued a highly critical report recommending abolition of the present functions of Rural Electrification Administration and several other federal lending agencies. It got a hot reception in the Democratic Congress.

The vote within the 12-man commission itself was not unanimous. There are three dissenters to the REA recommendation: Attorney General Herbert Brownell, Jr, former Postmaster General James A. Farley, and Congressman Chet Holifield (D-Calif.). Holifield is furious with the majority report—he disclaimed any association with it.

The report (Commission on Organization of the Executive Branch of the Government—Lending Agencies) recommends that REA be dismantled and replaced by a corporate-type agency which would:

- Be organized on a self-supporting basis,
- Secure its financing from private sources, and
- Be made subject to the Government Corporation Control Act.

Nine commissioners based their recommendations on the findings of a nine-man task force which studied the lending agencies. They found: (1) REA is losing money, (2) its low rate of interest to the Treasury, and the low rate of interest it charges borrowers, amount to "hidden subsidies," and (3) reorganized under the Control Act, it would be more efficient.

Brownell and Farley don't think there was sufficient study on the subject of REA. Holifield had this to say of the whole thing: "The commission report is so faulty in concept and method that I must object to it even though a few recommendations, standing alone, may have merit." He said many of the suggestions were similar versions of the 1949 Hoover Commission, and emphasized that Price Waterhouse & Co, certified public accountants, had participated in lending agency studies both then and now.

Paul Grady of Price Waterhouse headed study group which prepared a report forming basis, in part, for commission's lending recommendations. He was chairman of Hoover's 1947-49 lending agencies unit.

Some of the findings of the present commission in regard to REA are (figures as of June 30, 1954):

- REA had almost $2.9 billion approved for loans. Of this, almost $2.5 billion had been advanced to more than 1,000 electric borrowers.
- Approved electrification loans will provide almost 1.4 million miles of line and related facilities to serve 4.4 million consumers from a generating capacity of about 1.2 million kw, of which 826,000 kw has already been completed (1.25% of total U. S. generating capacity).
- The agency owed the Treasury more than $2 billion for advances, with further authorizations of more than $600 million. It received appropriations of more than $226 million for capital purposes.
- Interest charged by the Treasury may not exceed 2%, and interest payable by borrowers is also a flat 2% and not payable in the first five years. Because the Treasury now pays a long-range rate of 3%, the full possible interest returns on REA money cannot be received, the commission said.
- Growth of electricity usage will double investment of the electric industry in the next 12 years. If this same growth touches co-ops, loans required of REA will also double without considerable territorial expansion.

"In view of the great advance made in farm electrification, it is our belief that the time has arrived for the reorganization of the REA into a self-supporting institution securing its own financing from private sources in a manner similar to that of . . . other agencies," the report said.

Price Asks Import Embargo

- **Westinghouse president represents 51 firms opposing HR 1**
- **Cites poor quality of imported electric power equipment**
- **Senate committee seen writing some protectionist provisions**

A complete embargo on imports of electric power and communications equipment was asked of the Senate Finance Committee by Gwilym A. Price, president of Westinghouse Electric Corp, speaking for 51 companies who manufacture all kinds of electrical equipment.

In opposing H. R. 1, the Administration's reciprocal trade bill, Price made a slashing attack on the quality of foreign generating equipment, citing half a dozen instances of breakdowns he said were caused by the inferior quality of the cheaper imported equipment.

Some of Price's examples are as follows:

- In an unspecified location in Canada, a European-made waterwheel generator failed "very shortly after it was put into operation . . . apparently due to design deficiencies," Price said. The unit was out of service six weeks. At the same time, two generators in the same installation, made in Canada with U. S. design and technical assistance, Price declared, showed no design deficiencies or failure, although "each has been shut down, one for one week and one for three, due to not unusual initial operating problems."
- Last April, Price said, two units in the Hearn Station in Toronto exploded, and major moving parts had to be returned to the manufacturer in England. Damaged units, he said, are still not back in service.
- Ten 5,000-hp electric motors bought by the U. S. government abroad for a defense installation needed work in a U. S. plant to make them servicable, Price continued.
- A co-op in the Southeast, Price said, found after 30 days of operation that one of two 6,500-hp turbine generators bought in Switzerland had to be taken out of operation because of failure of "certain parts."
- Price also said that the first items of equipment received by the Army Corps of Engineers for the large generators at McNary Dam "were not in good condition, although usable."

Price said that defense essentiality of the U. S. industry that makes such equipment makes tariff protection a necessity. He said that foreign makers can undersell U. S. producers by 30 to 40%, and that present tariffs of 8¾% to 17½% are inadequate.

While the embargo Price suggested seems completely out of the question, there is reason to think that the Senate Committee may write some protectionist provisions into the reciprocal trade bill which got through the House as the President wanted it—with no new string tied to his authority to negotiate further tariff reductions in the interest of expanded world trade.

South Seeks Protection

The biggest single development is the defection of several Southern senators, who for years have comprised the heart of the free-trade bloc. Basically, they have always wanted world markets for the South's cotton farmer, and cheap prices on the manufactured items the farmer bought with his cotton money. Now, however, the Southerners also want protection for their cotton textile mills which fear cheap imports, particularly from Japan.

Some New Deal Democrats are talking up a program which would give federal subsidies to industries knocked low by imports coming in over low tariff walls, but this is spurned by most Republicans and conservative Democrats.

Protectionists may win some battles in the Senate Finance Committee, but odds still favor the Senate itself approving the President's program, just as it was passed by the House.

Hells Canyon Measure Is Scored by Roach

Commenting on introduction of legislation in Congress for a high federal dam at Hells Canyon, T. E. Roach, president of Idaho Power Co, said the public interest will not be served by "injecting another dose of public power politics into an issue about to be decided by a legally constituted federal agency on the merit of engineering and economic facts."

He said the public power politicians are unwilling to abide by, or even await, the decision of the Federal Power Commission. This agency has conducted extensive hearings on the question of whether a federal single, high, multipurpose dam or Idaho Power's proposed three low-head dams should be built on the Hells Canyon reach of the Snake River.

Roach pointed out that studies were made by staff engineers of FPC as well as company engineers, public power intervenors, and independent expert witnesses.

Engle Spearheads Power Policy Attack

Democrat criticizes Hughes' role in partnership concept
Budget Bureau head says revised cost circular is tentative
Republicans, Democrats charge politics was behind circular moves

The first direct Democratic attack on the Republican Administration's partnership power policy as such was launched last week.

Chairman Clare Engle (D-Calif.) of the House Interior Committee started it by hauling Budget Director Rowland Hughes over the coals for his part in formulating and fostering the partnership concept.

The first session was a two-hour struggle over a plan being circulated by the Budget Bureau which would have the effect of raising federal power rates and irrigation costs. The plan is embodied in a tentative revision to Budget Bureau Circular A-47, which sets forth guidelines for allocating costs of federal water projects. The revision has not yet been approved by the Administration. Nevertheless, it has already become the jump off point for Engle's over-all attack.

The basic Democratic charge is that the circular would force federal hydro and irrigation beneficiaries to pay more of the cost of federal multipurpose projects, with less of the cost drawn from general Treasury funds.

Liberalize Reclamation Law

Engle charged, "This document empowers the Budget Bureau to stop any project while we here in Congress still have that project under study. It, in effect, makes it mandatory on the Interior Department to do things not authorized by law.

"What we need now, in view of the increase in postwar construction costs, is to liberalize reclamation law—this moves in the opposite direction," he declared.

Hughes emphasizes the tentative nature of the circular revision. He said it "is not a draft of a revision for submission to anybody—it is still a staff suggestion to their superiors in the Budget Bureau, and it is being circulated so that we will have the views and opinions of every interested agency within and without the government, before we decide what to do with it." Hughes said, "This is a compilation of ideas—not a policy—and it must await the report of the Cabinet Committee on Water Resources before we will consider that all evidence is in, and before we make up our minds whether to turn it into a general policy for the Administration as a whole."

Budget Bureau Testimony

Hughes and his aides testified:

The original Circular A-47 was issued Dec. 31, 1952, in the dying days of the Truman Administration. It provides that federal multipurpose projects be amortized over 50 years and that only benefits accruing to each method of using stored water be used in computing the portion of over-all cost of construction to be borne by that use.

Under Hughes' direction, a revision to Circular A-47 was put into circulation throughout the government in September, 1954. This provides, in addition to the standards in the original circular, that a formula of cost allocation be used which places a larger cost burden on reimbursable water uses.

The present Administration's revision to Circular A-47 is not yet an established policy.

Both sides of the political aisle charged that politics was behind the circulars.

Republicans, notably Rep A. L. Miller (R-Neb.), declared that officials of the Truman Administration planted a last-minute time bomb within their successors' political machinery, which they hoped would be exploited later as part of the incoming Administration's reclamation policies.

Democrats, led by Rep Walter Rogers (D-Tex.), indicated the circular really was not the work of the outgoing Democrats, but was, instead, the first step in implementing the as-yet unannounced policies of the incoming Republican Administration.

Miller charged: "There seems to have been collusion. This was issued in the last days of the Truman Administration, with a political aim."

Engle declared: "A vicious policy, wherever it originates, should be stopped . . . certain people in this Administration want to liquidate Western reclamation as we know it."

Engle said he thought the Eisenhower Administration had taken on its shoulders a policy-setting function which rightly belongs to Congress, and that was the reason for his investigation.

A battle erupted over whether the committee had, in the first place, a right to make public the contents of the revision to the circular being circulated. Rep John P. Saylor (R-Pa.) pointed out that the document itself was labeled "administratively restricted," and he was joined by Rep Craig Hosmer (R-Calif.) in denouncing this invasion of the privacy of the executive branch of the government.

Engle said the executive is a "big outfit—what it does is pretty well known unless its documents are marked 'secret' or 'confidential'."

Two Documents Discussed

Engle attempted to question Hughes as to how the revised circular differs from the original version, and how it would apply to existing, or proposed, reclamation projects. He wasn't very successful. Hughes did not discuss the differences in the two documents, and his only remark about applying the revision of the circular's criteria to a particular project was: "We haven't applied it to the Upper Colorado Project, but the original A-47 was applied, and Upper Colorado passed the test."

Several committee members tried to spike the investigation before it got off the ground. They complained that, while they were familiar with the old circular, they had not yet seen the revision now being circulated. They wanted to wait until they had a chance to study it. Engle observed that it had been going the rounds of federal agencies for more than four months, and that any committee member who

was interested would have obtained a copy whenever he wished. He added that representatives of the National Reclamation Association had denounced it in public hearings earlier this year.

The hearings are in recess while the committee completes its consideration of the Upper Colorado Plan. They'll resume on March 30, with Interior Secretary Douglas McKay as a witness.

MVGC Opponents Sue to Upset SEC Approval

State of Tennessee and a group of Tennessee Valley public power associations last week asked the U. S. Court of Appeals to reverse the Securities and Exchange Commission's favorable ruling on Mississippi Valley Generating Co's equity financing.

MVGC was formed by Middle South Utilities, Inc, and Southern Co, to supply 600,000 kw of power to Tennessee Valley Authority to replace a similar amount TVA would supply to atomic installations.

The suit filed with Securities and Exchange Commission is relying on two major points:

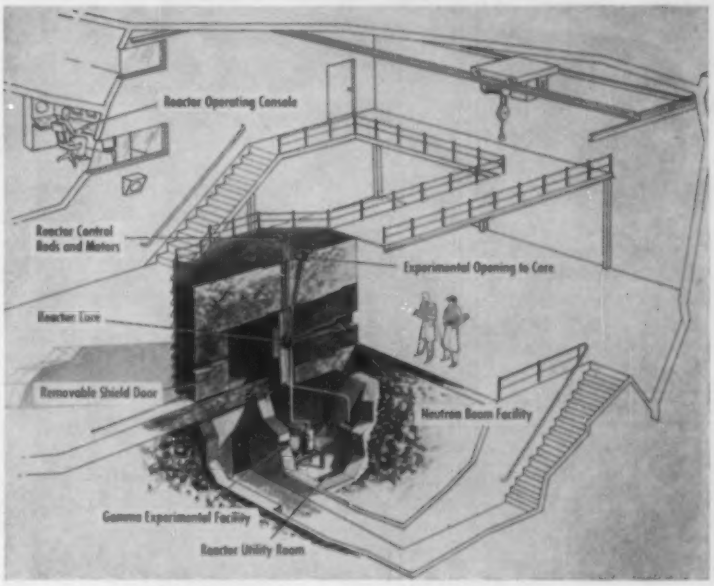
- That SEC committed an error of law in finding that MVGC met requirements for integration of public utility holding systems as set forth in the Public Utility Holding Company Act of 1935.
- That SEC also erred when it ruled that the MVGC proposal did not violate the prohibition on interlocking relations or concentration of control of public utility systems against the public interest.

Altogether, the MVGC opponents charge SEC committed 24 errors of law in approving MVGC's financing plans. This approval allowed MVGC to issue $5.5 million in common stock to Middle South and Southern Co. Later this utility group will ask SEC authority to borrow up to $120 million from banks and insurance companies.

Index is Available

Electrical World's semi-annual index for July-December 1954 has been prepared, and copies are now available upon request. They may be obtained without charge. Address requests to Electrical World, Editorial Office, 330 W. 42nd St., N. Y. 36, N. Y.

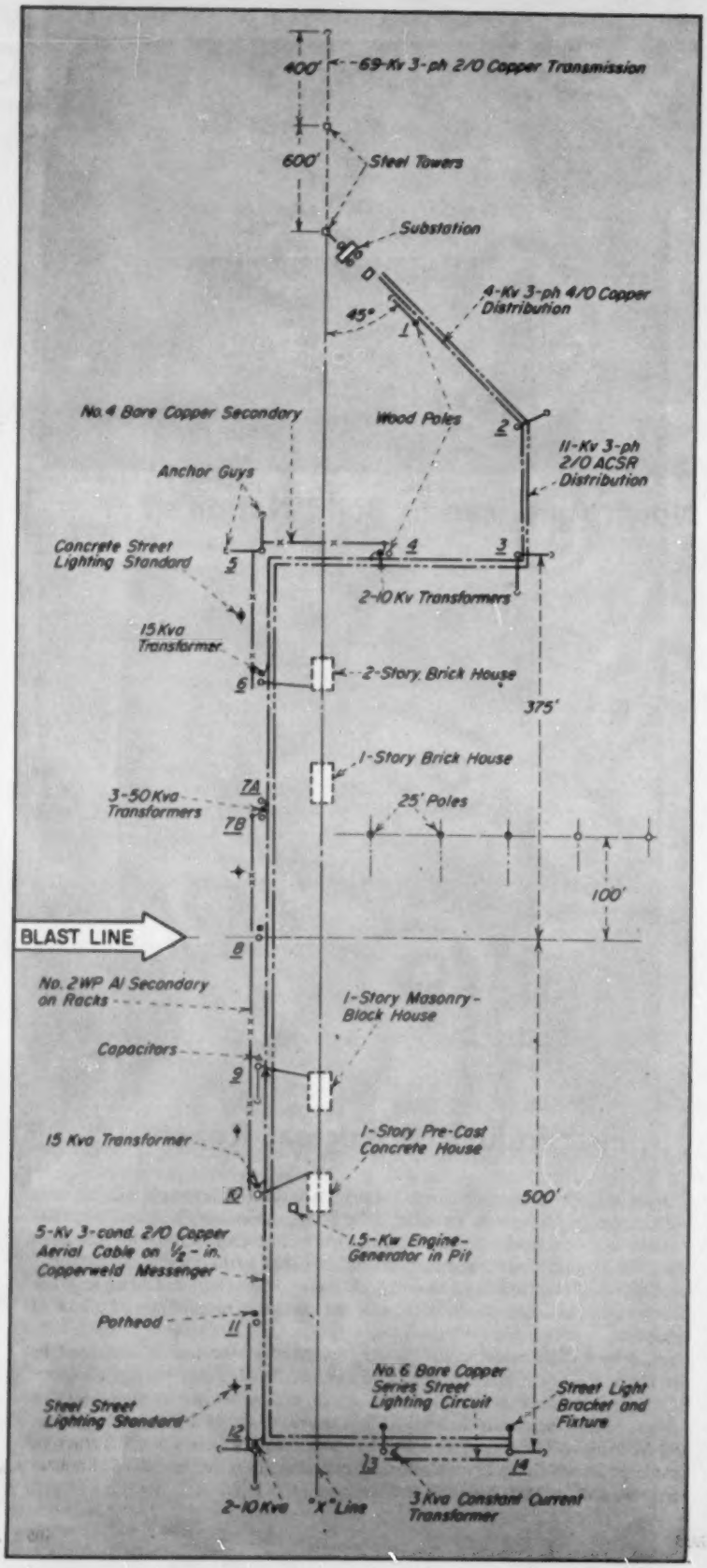
North American to Build Nation's . . .



. . . First Industrial Nuclear Reactor

First nuclear reactor designed for private industrial research will be built for the Armour Research Foundation by North American Aviation, Inc. The reactor and associated equipment is expected to cost about $500,000. The unit, designed for a power level of 50,000 w, is slated to be located at Armour's operations on the campus of Illinois Institute of Technology in Chicago. Work is scheduled to begin this month with completion scheduled for the end of the year.

A three-ft high model of the reactor (pictured at the top) is explained by Dr Harry Pearlman, chief project engineer for North American, to Charlotte Mihalek, laboratory assistant. Artist sketch of the reactor is shown at the bottom. The reactor will be located in a room about 48 ft long, 72 ft wide, and 30 ft high. The reactor core will be surrounded by an 8 x 5 x 5 ft stack of graphite bars which act as a reflector. Overall dimension for the shielded reactor structure will be 18 ft long, 16 ft wide, and 11 ft high.



A-Test Plot Plan of Electric Units Is Made Available

Location of power lines and equipment scheduled to undergo atomic explosion tests in April at the Nevada Test Site has been outlined in a recently released drawing of the plot plan.

Duplicate installations of this equipment at different distances from the test explosion and outside the area of total destruction will be built at the site. Each installation is based on a transformer substation of the kind found in most communities.

The illustration at left indicates the exact location of the equipment of one installation. On one side of the transformer substation will be typical transmission lines and towers. On the other side will be typical power pole wiring with associated pole transformers and other equipment. Power lines will run from the poles to some of the houses being tested by the Federal Civil Defense Administration.

Each system will be in working order and will be tested for operation before and after the blast. Parts of the system will be energized during the detonation.

The tests will be made by the Federal Civil Defense Administration to determine vulnerability of electric system parts to atomic blasts and the nature of repair problems (EW, March 7, p 77). FCDA invited Edison Electric Institute to participate in the tests. To supervise engineering construction of the structures, EEI engaged Bechtel Corp of San Francisco.

Results of the test will be studied and analyzed by a committee of engineering experts.

7th McNary Unit Added

Army Corps of Engineers reports that the Columbia River's McNary dam powerhouse project reached the half-way mark on schedule late last month when the seventh 70,000-kw generator went on the line. The eighth unit is slated for generation in May. To date, the generating units have been operating above the 500,000-kw potential because of Pacific Northwest demands.

Rain and Wind Storms Cause Light Utility Damage

Worst wind and rain storm of the year, originating in northeastern Indiana and sweeping across Ohio and Pennsylvania, caused spotty utility damage. Total storm damage reached an estimated $3 million and flood damage along the Ohio River, $13 million.

Winds, recorded at 92 mph, whipped down power lines and the swollen Ohio River threatened at least one electrical plant.

A toppled pole in Bellevue, a Pittsburgh suburb, is shown, above left, hanging on power lines. At the right, Indiana-Kentucky Electric Co's partially completed 1-million-kw Clifty Creek generating plant at Madison, Ind., is seen surrounded by flood back waters. Plant continued to operate despite rising waters.

Indiana & Michigan Electric Power Co, Fort Wayne, Ohio Power Co, Canton, and Duquesne Light Co and West Pennsylvania Power Co, both in Pittsburgh, reported slight damage and service interruptions.

A Duquesne Light Co spokesman said several thousand customers were thrown out of service but most were cut in again within a short time. Trees and debris falling into distribution lines caused most of the damage.

U.S. Antitrust Study Hits 2 Key Industry Problems

An Administration-sponsored report on possible changes in the antitrust laws hits two main electrical industry problems:

- On the function of Federal Power Commission and other regulatory agencies, the report mainly discusses the problem of relating antitrust to the general exemption given such regulated industries as electric utilities.
- On patents, it has much to recommend that's of prime interest to electrical manufacturers who have been or are now involved in antitrust cases.

The study—due to be released sometime this month—is the most exhaustive review of antitrust law and Supreme Court decisions ever sponsored by the government. The 347-page report is the product of more than a year's work by the Attorney General's National Committee to study the antitrust laws.

In regulated industries, the committee feels that where the appropriate federal agency—such as FPC—has approved agreements or conduct that is made the target of an antitrust action, the antitrust charge should be dismissed.

But the committee approves of right of the Department of Justice to come into an agency hearing or the federal courts to urge antitrust considerations in any action that results in an exemption from the antitrust laws.

The report further calls for clarification by the Congress on the roles to be played by the courts and the regulating agencies where challenged conduct fits under both the antitrust laws and the regulatory laws.

As an example of the confusion in this area, the committee cites several recent cases involving supply contracts between Pennsylvania Water & Power Co and another utility. They were held invalid by one federal court under an attack that they were in restraint of trade. Yet, another federal court upheld an FPC rate order (issued after investigation of the rates set up in these same contracts) in the face of attacks on the validity of the contracts, saying the Federal Power Act "left only a limited area for application of antitrust considerations to FPC decisions."

The committee does take a good, hard look at patents, where the legal monopoly granted in a patent gets mixed up with use of a patent to create an illegal monopoly or restraint of trade. Taking up a whole batch of situations—tying-in clauses, patent interchanges, patent pools, infringement suits—the tone of the discussion is that maybe the courts and the government have gone too far.

Licensing Reviewed . . . Court decisions ordering compulsory licensing at reasonable rates are approved. But a majority of the group soundly condemns royalty-free licensing, thinks it penal rather than remedial, and beyond the Sherman Act's authority to "prevent and restrain violations."

The report, which hits all of the many-sided problems in antitrust, covers five other major areas: mergers, limitations on competition, foreign commerce, distribution, and enforcement.

By Evaluating Aptitudes . . .

By Helping the Beginner . . .

Personnel Departments Can Boost

C. B. BOULET, Vice President-Personnel, Wisconsin Public Service Corp, Greenbay, Wis.

All too often production men look upon personnel managers as a necessary but non-producing adjunct to the operating program. All too often personnel men develop a conception of their responsibilities which emphasizes the humanitarian and idealistic aspect of their work and virtually ignores the idea that they and their activities should contribute to the production of a profit for the company.

This is not surprising when it is realized that many of the functions of personnel administration have to do with employee welfare. Certainly constant contact with problems relating to disturbances within the families of employees, such as sickness, death, retirement, and financial difficulties, cannot help but create a social consciousness which tends to separate personnel activities from the hard facts of corporate life and company profit.

Men More Important Than Machines . . . This humanitarian and sympathetic attitude is not to be condemned but rather praised. It should be recognized, however, that this social function is not the end objective of personnel administration but rather represents a small segment of an overall operation which, properly directed, must make a substantial contribution to the production of earnings and profits. It is with the hope of dispelling some misconceptions and emphasizing the value of intelligent administration of the personnel department that the following comments are made.

Although there have been many technical developments over the years, most of which have reduced manpower requirements and specific operation, these same developments have increased the importance and value of the individual on each job through the increase of power and production over which the individual worker has control. The labor force continues to be the key to efficient or inefficient operation.

Community Attitude a Factor . . . The employment of qualified workers becomes of greater importance than at any time in the history of our industrial growth. It is at this point where the first utilization of a sound personnel program can be made.

The problem of securing the best people available actually starts with the development of a proper community attitude toward the company. If the community feels strongly that a company is a good place to work, the problem of attracting a desirable work force diminishes. Where this attitude exists, companies find themselves with a constant waiting list of desirable applicants. Developing this favorable community atmosphere is a definite function of the personnel or employment department.

Testing Is Important . . . The second step in acquiring an efficient work organization is screening applicants. Such screening can be accomplished through planned interviewing, the use of references, and careful testing.

Proper placement after selection must give consideration to those characteristics which make certain individuals successful in one job but not in another. Tests can reveal these characteristics to a remarkable degree and eliminate the danger of placing misfits in any given job.

The effect of these procedures on efficiency and profit becomes apparent. The cost of training a new man is high. The expense of finding by trial and error that a man is a misfit is non-productive expense and is reflected in the cost of operation.

By Increasing Job Skill and Understanding of Business . . .

Company's Earnings and Profits

When a new employee has been selected, it is not sufficient simply to have the individual report to the production superintendent. At the time of hiring every normal individual has a receptive attitude. He wants to please. He wants to make a good impression. It is at this time that the new worker will make a supreme effort to understand and accept the company's philosophy regarding work, customers, and those things that management expects in the way of attitude, cooperation, safety, and profits.

Failure to provide a program of proper indoctrination at this point will have far reaching effects on both production and profits.

Guard Against Bad Early Influences . . . It is quite certain that before the new employee is at work very long he will be subjected to other influences which may be good or bad depending on the attitude of his work crew, of the labor organization representing him, of his immediate supervisor, and many other factors.

If these influences make an indelible impression during the early work life of the employee, the difficulty of converting him to any other philosophy is immeasurably increased.

The employee's supervisor must play an integral part in any indoctrination program. The supervisor must be trained to the point where he will supplement the work done by any other source and continue the employee's indoctrination through the first weeks or months of employment.

The next step should be training the individual for his job. It was not long ago that a new lineman simply started as a groundman and graduated over a period of time into a journeyman. This process produced some good linemen, but many who acquired the journeyman's title, mainly through seniority rights, should in fact still be at the groundman's level. This topsy-like development is costly and tends to produce an inefficient work force. Forward-looking and profit-minded personnel men have taken steps to remedy this sort of situation.

Training Schools Are Valuable . . . Many companies have established training courses and so-called "schools." These cover continuous training of groups of men for periods varying from four to six weeks.

Operating supervisors indicate that these training courses not only produce highly efficient, intelligent, and safe workers, but actually bring the men to a productive peak a year or more sooner than under the old hit and miss program.

There are many other fields where proper personnel operations make valuable contributions to the company's net income. An adequate job evaluation program is one of these. Such a program guarantees not only equitable treatment for various jobs but at the same time stops the efforts of employees, individually or in groups, to pressure the company for wage increases.

Explain Fringe Benefits . . . Benefit programs have become an important segment of over-all labor cost. They effect profits very directly. In the public utility industry the average cost of fringe benefits is estimated at better than 20% of payroll. It is a special problem to develop ways and means to utilize benefit plans and to make of them a motivating factor in company operations and production.

Benefits can be stressed through company magazines, direct mail, employee meetings, bulletin board notices, and particularly through personal discussions between supervisors and men in their day-to-day relationship.

It is unwise to assume that work-

(*Continued on page* 215)

Continuous cable run from pole to customer's meter provides neat-appearing installation . . .

Kansas City Service Drop Obviates

Self-supporting service cable, unbroken from pole to meter, facilitates installation and operation

H. R. WADE, Electrical Engineer,
Kansas City Power & Light Co,
Kansas City, Mo.

The "Kansas City service drop" has several unusual features. It consists of a special service entrance type of cable which was developed a number of years ago, using copper conductors.

In 1952 the cable was changed. It now consists of two hard-drawn insulated aluminum conductors and a flat bare aluminum neutral. The service drop consists of a continuous run, without splices or taps, from the pole to the meter.

A service drop of this type has a number of advantages:

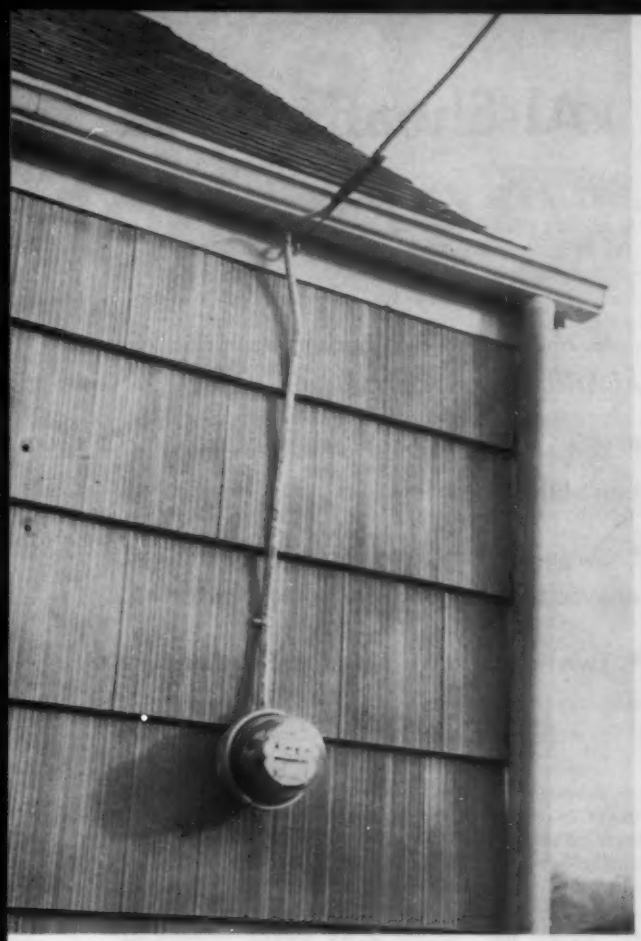
1. Elimination of power theft.
2. Elimination of contact hazard to employees and the public.
3. More attractive appearance.
4. Convenience of installation and operation, especially through trees.
5. Elimination of tree trimming, abrasion of insulation, power loss, and interruption of service because of burndowns.

In general the cable is self clearing in trees because of the sawing action of the bare neutral. This action results from the slightly concave shape of the ribbon of the bare neutral.

The insulated conductors are covered with Neoprene. In order to test its moisture resistance a sample of the cable was immersed in tap water for 48 hr and then given a dielectric test. It broke down at 21,000 v. A dry sample of the same cable broke down at the same voltage.

Standard accessories are used for installing these services. Aluminum is cleaned thoroughly and treated with a conventional inhibitor when connections are made. No difficulties have been experienced because of corrosion; and, so far as is known, no cold flow has caused loose connections.

Installation follows this procedure.



Aluminum-wrapped cable is not tapped . . .

Pipe through roof solves clearance problem

Theft, Tree Problems, Contacts

A standard cable grip is attached to the pole end of the cable and fastened with an open bail to the spool insulator of a secondary rack. Attachment to the house is made with a standard cable clamp that has its groove coated with emery. The attachment is made to the service hook. The cable passes through the cable clamp and along the house to the meter socket which it enters through a waterproof fitting. The cable is fastened along the house with straps.

At the service cable clamp, instead of forming a drip loop, a hump is formed. It is just as effective and is easier to form.

The length of aluminum service drop is limited to a maximum of 125 ft, the same as copper. Longer services would increase sag and decrease ground clearance which is a critical factor in the case of ranch type houses.

Attaching and maintaining an aluminum cable along the side of a house causes no discoloration of even a white house. No difficulty is encountered by the owner in painting the cable when repainting the house. Occasionally, however, one or more of the ingredients of paint will leach out cable compound and cause wall discoloration. It is believed that this type of paint is heavy with oil.

During the summer of 1954, officially recorded ambient temperatures of 113F caused no dripping of compound from service cables.

No aluminum cable has been installed inside a house, either to an inside meter or to an appliance of any kind.

With standard types SE and SD copper cable, there was considerable tree trouble. The company received many complaints from customers that the covering had worn or weathered off.

No trouble has been experienced with the few trial installations of aluminum cable made in 1948 or with the regular installations made since early in 1952. Kansas City Power & Light Co installs approximately 10,000 services or 1 million ft of cable each year.

In the last three years approximately 30,000 services or 3 million ft of aluminum cable were installed.

Al-Sheath Aerial

In one of the first such installations in America Boston Edison used:

- **Larger radius bends to facilitate installation of the new cable.**
- **Large-diameter copper instead of lead sleeves to withstand pressure of cable oil.**
- **Two tinnings on aluminum sheath before wiping the sleeves.**

A. F. CORRY, Head of Technical Methods Division, Engineering & Construction Dept, Boston Edison Co, Boston, Mass.

Aluminum-sheath aerial cable is being tried on the Boston Edison Co system to evaluate the advantages of the cable's light weight and possible longer life. In the 3,700-ft long initial installation new methods of line construction and splicing were necessary.

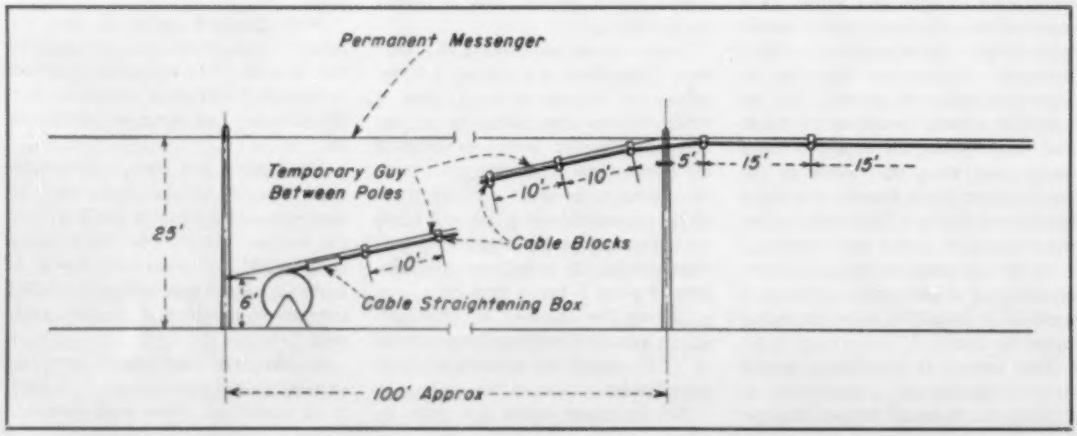
Large radius bends were required at the location where cable leaves the reel and at corners because of the aluminum sheath's rigidity. For the same reason, a copper sleeve for connecting to the new cable was developed to eliminate possible damage to a lead sleeve caused by excessive oil pressure during load cycling. Sealing the aluminum joint was handled by tinning the aluminum twice before wiping.

The cable is rated 15-kv and has three, 350-MCM, paper-insulated copper conductors. Around the compact conductor sectors is a sheath of aluminum which, in turn, is jacketed with polyethylene (See Table I).

Why Aluminum Sheath? . . . The aluminum-sheath cable chosen results in a 30% weight savings over lead-covered copper-conductor cable (See Table II). Using aluminum for conductors as well as sheath would reduce the weight another 20%. However, the latter construction was not selected because it was thought desirable to confine the trial installation to only one variable.

Another reason for selecting aluminum sheath is that aluminum has 25 times the fatigue strength of lead and about 7 times the hardness. These advantages indicate that the new cable will have longer life in aerial use.

During stringing operations aluminum-sheath cable is pulled from the reel . . .



Cable Requires New Practices

The sheath was jacketed with plastic to avoid possible corrosion of aluminum, particularly at supports. Because the thermal conductivity of aluminum is higher than lead, polyethylene was used so the cable would be subjected to relatively low temperature during vulcanizing. Jacketing permitted reduction of sheath thickness in accordance with the company's standard practice for lead-covered duct-lay cables. This reduction had the important effect of decreasing rigidity.

Method of Installation . . . First step in the stringing operation was to install a $\frac{7}{16}$-in. high-strength galvanized steel messenger. Average section lengths of 104 ft have the following characteristics: Sag conditions, 25% of ultimate at 60F; maximum tension, 33% of ultimate under NESC heavy-ying loading; maximum sag, 2.5 ft. Stringing blocks were placed 15 ft apart.

At corners a large bending radius of 8 ft was devised. Varying lengths of ¾-in. eye bolts were inserted at intervals of one ft into a heavy crossarm, which was temporarily mounted on the pole. A short piece of messenger was strung through the eyes and clamped to the permanent messenger. Effective lengths of bolts was then adjusted to give a reasonably smooth arc, while keeping the messenger taut with turnbuckles. Cable blocks were hung between each pair of bolts in the normal manner.

To pull in the cable the arrangement shown below permitted a very gradual bend from the reel to the messenger. A wood straightening box reduced waves in the cable after unreeling. As the last turn left the reel a restraining line was attached to prevent the cable from jumping out of the blocks.

The cable was field lashed to a messenger using 91-mil galvanized soft steel wire to insure moderate bearing pressure on the polyethylene. Lashing was used instead of support rings because:

1. Installation was faster.
2. Grade clamps were unnecessary.
3. And longitudinal movement was restricted.

At corners the cable was lashed up to the clamps holding the temporary

Table I—Details of Aluminum-Sheath Cable Construction

Conductors	3 350 MCM copper compact sector
Insulation	Paper AEIC specification
Sheath	0.080-in. aluminum
Jacket	0.090-in. polyethylene

Table II—Comparative Weights of Conductor and Sheath Combinations

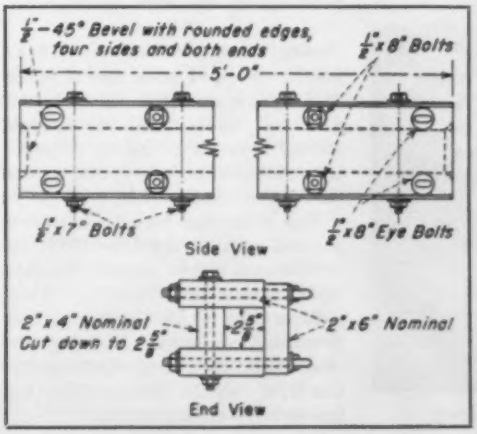
Conductors	Sheath*	Weight—Lb per Ft	Ratio
3 350-MCM copper	Lead	8.60	100%
3 500-MCM aluminum	Lead	7.70	89.5%
3 350-MCM copper	Aluminum	6.04	70.2%
3 500-MCM aluminum	Aluminum	4.20	48.8%

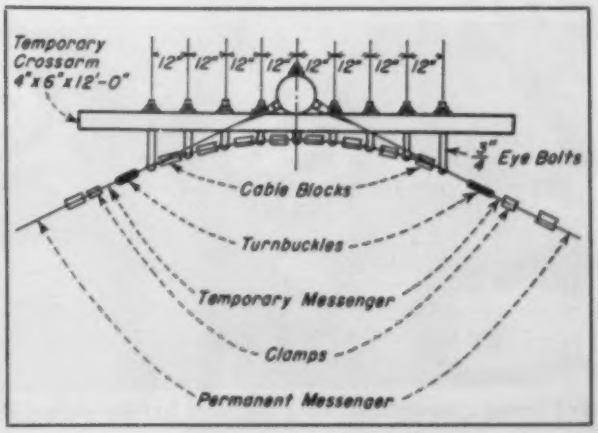
* Lead sheath 0.120 in. thick and no jacket
* Aluminum sheath 0.080 in. thick with 0.090-in. polyethylene jacket

Table III—Characteristics of Installed Messenger

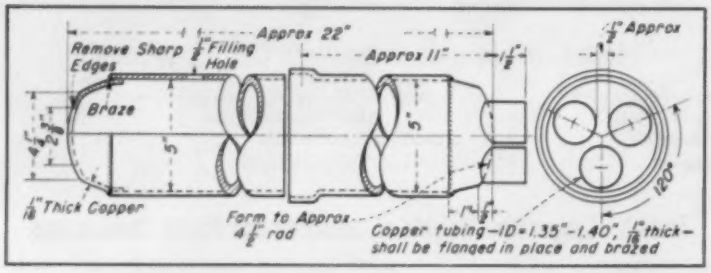
Size	7/16-in. high-strength galvanized steel
Sag conditions	25% of ultimate at 60F
Maximum tension	33% of ultimate under NESC heavy loading
Maximum Sag	2.5 ft
Average section	104 ft

through a straightening box and . . . then around corner having a curvature of 8-ft radius



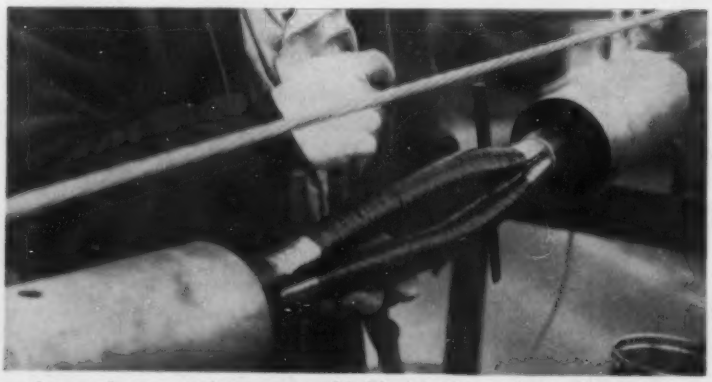


For making joints polyethylene jacket was cut back . . .



trifurcating joint sleeve was positioned around the cable . . .

conductors were sweated together and smoothed . . .



and taped connections were shielded before wiping sleeve

messenger and then manually tied to the permanent messenger with zinc strapping from the clamp to as close as feasible to the pole. Temporary crossarm and messenger were removed.

Jointing the Most Important Problem . . . A joint sleeve was used to connect three single lead-covered cables to the aerial cable. Sleeves for joining the aluminum sheathed sections were similar except that trifurcating was not involved. Because the aluminum sheath offers great resistance to the expansion of the cable oil under load cycles, it was felt that the resultant pressure would be excessive for a lead sleeve. For this reason 5-in. ID copper tubing was used.

Wiping of joints presented a problem because of inexperience in soldering aluminum satisfactorily without fluxes. A satisfactory wipe depends chiefly on obtaining a good tinned surface on the aluminum. Several tinning mixtures were tried before selecting one of approximately 77% tin, 20% zinc, and 2% lead. This had satisfactory bond strength, resisted abrading action of wiping, and melted at temperature low enough to minimize drying out of outer tapes.

No flux was used in the wiping operation. Instead the sheath was abraded by a file card, tinned immediately to prevent re-oxidation, and then retinned with 50-50 solder to prevent oxidation of the special solder. The wipe was then made using new wiping solder and unimpregnated wiping cloths. Because of the possibility of picking up excess tin, new wiping solder must be used in making each wipe. Wiped joints were covered with two layers of neoprene tape, half lapped, followed by one layer of black polyvinyl chloride tape overall.

Testing Joints and Cable . . . Bend tests on a wiped joint showed a life of 4,100 cycles. Cable alone showed a life of 30,000 cycles. Other tests showed that the cable dielectric strength, measured by radial power factor, was unaffected by wiping.

This cable has been in operation at rated voltage since June 1954. Its performance will be carefully watched to accumulate data.

Experience with paper-insulated aluminum conductors is being obtained with an underground installation (EW, July 24, 1952, p133). This has operated without trouble.

Commercial Electric Cooking:

The Utilities' Poor Little Rich Load

An EW Editorial Sales Feature

• It delivers choice loads and revenues to those who promote it

• If you don't add at least 1 Kw per food service customer a year, read on . . .

If electricity is the "lifeblood of industry," there is one industry that apparently doesn't know it yet.

It is a big one—in fact, the nation's fourth largest retail business—where electric power has yet to get itself hired as the number one handyman.

Food service is its name, and judging from the market, gas is too much its game.

As one industry figure put it: "Except for lighting and so forth, you could dang near cut off the power and those birds would never know it."

This may be overly dramatic, but those who work closest to it agree that on a national scale, commercial cooking electrically still has a lot of expanding to do. Each day food service operators over the country turn out some 75 million meals. The gas people say their fuel cooks 95% of them. Other estimates place it at a high, but not quite so high figure.

Commercial electric cooking seems to be the utilities' poor little rich load. Rich because of the high potential and good load characteristics it offers, poor because it does not get the utility attention it warrants.

But that isn't the story everywhere. Some utilities are putting chef's hats on their kilowatts. They are promoting hard, cracking the market, and building brand new loads and revenues.

On the next 11 pages, 43 of the nation's companies and municipals who are cooking up big sales show you how they do it. For their help in preparing this material, and their permission to publish it, Electrical World extends its sincere thanks.

THE PRODUCT . . .

Specialized electric cooking equipment for the food service industry — fry kettles, broilers, griddles, ranges, ovens, food and roll warmers, grills, etc

Some of their advantages:

Better heat control — Better foods

Longer life — Lower maintenance costs — safer

Lower food costs (less meat shrinkage, less fat waste)

THE MARKET . . .

Food service is nation's 4th largest industry:

Annual sales — $17 billion . . . by 1970, $35 billion

Total outlets — well over one-half million

THE OPPORTUNITY . . .

Each food service operator represents:

A potential load of 30 Kw

A total of $23 per Kw in estimated annual revenue (EAR)

A total of $690 in EAR

This means:

Total potential of 15 million Kw, $345 million EAR

Market is barely scratched: saturation as low as 5% to 15% in some areas . . . 50% or more in others (notably institutional and in-plant feeding)

Load offers good characteristics, top revenue — EAR from small fry kettle equals that from four domestic ranges

THE SITUATION TODAY . . .

It is the utilities' poor little rich load — a lucrative market not properly promoted

The reasons:

Too little management support

Inadequate promotion investment

Too little trained manpower to sell it

On the other hand:

Strong competition — commercial cooking load means a lot to the gas people. They nurse it jealously, service it well, promote it hard

THE TREND . . .

Toward electricity everywhere — but switch is in high gear only where full-scale utility support backs the drive

In the study which follows, Electrical World gives you a look at the commercial cooking field . . . analyzes management methods and sales techniques which have proved most effective among 43 of those utilities which lead the industry in sales

COMMERCIAL ELECTRIC COOKING

Nation's Top Promoting Utilities Are Getting Sizzling Results . . .

In 1954 they added:

- **1.75 kw per food service customer***
- **$23.40 in annual revenue for each new kw***

Commercial electric cooking is a fast-moving business. Its sales requirements are demanding, but its rewards are high for those who want to go after it.

It wasn't until after World War II that any utility started to dig in seriously, and it wasn't until 1950 that one of them added as much as 10,000 kw of new commercial cooking load in a year. Last year five of them did it (see table below), and two more are on the threshold. Those who have cracked the market are somewhat amazed themselves at the rapidity with which commercial cooking seems to snowball once it gets rolling.

One of these is Duke Power Co. Five years ago commercial electric cooking was practically unknown in its territory. It had gas properties. After their sale in 1951, Duke was quick to see commercial electric cooking's good load factor and set to work. Last year, only 36 months later, it added 10,163 kw to its lines and $254,000 to its revenue. Another campaigner, Pennsylvania Power & Light Co, in the business only eight years, sold $2 million worth of commercial cooking energy in 1954, and new business is coming in at the rate of nearly one-half million dollars per year.

Success stories can be told by all the 43 utilities covered in this study. Washington Water Power, for example, figures that last year alone it put an average of 5.5 additional kw into each eating place it serves. Appalachian Electric Power Co and Atlantic City Electric Co say they added at least 4 kw. Together, all the utilities studied here rang up a total 198,957 kw in new load or an average of 1.75 kw added for each food service customer.

When loads like these are converted to dollars, commercial cooking means big business. Values placed on the load differ by the various utilities. They usually run from $20 to $30 per kw. Kansas Gas & Electric Co values its load well over $30. Average for those studied here is $23.40.

At least two companies more than doubled their rate of growth in '54: Gulf States Utilities Co (from 1,870 kw in '53 to 4,572 kw) and Mississippi Power & Light Co (460 to 1,722 kw). Others like Duquesne Light Co, Northern States Power Co, Indiana & Michigan Electric Co, Duke, Atlantic City, and New England Electric System, each beat its previous year's record by 2,000 kw or more.

Growth like this is starting to deliver some telling blows to other fuels. One leading cooking equipment manufacturer already predicts that in the areas where utilities are promoting, commercial cooking will be entirely electrified within the next 15 years.

Conclusion: If you're not adding at least one kw of commercial cooking load per customer per year, then read on. These utilities do.

*Average for the 41 utilities which reported their results in this study

LOOK AT THE NEW LOAD and revenues commercial electric cooking delivered to these five utilities last year:

	Kw Added	Added Revenue (EAR)	No. Food Service Customers
Pennsylvania Power & Light Co	16,889	$422,000	5,000
Appalachian Electric Power Co	15,635	$391,000	3,700
Ohio Power Co	11,812	$225,000	3,037
Carolina Power & Light Co	10,402	$207,000	3,500
Duke Power Co	10,163	$254,000	3,225

Twelve more companies added at least $100,000 in EAR, one of them with as few as 1,000 customers

SPECIALIST SPEAKS THE CHEF'S LANGUAGE, understands his problems, gives personal service. Trend is toward hiring more of them. Western Massachusetts Electric's commercial sales chief (above) is himself an expert on cooking

. . . They Do It with Specialized Selling and Adequate Manpower . . .

- **77% of them have a commercial cooking department and/or specialists**
- **There's an average of 2.14 men working on each 1,000 accounts**

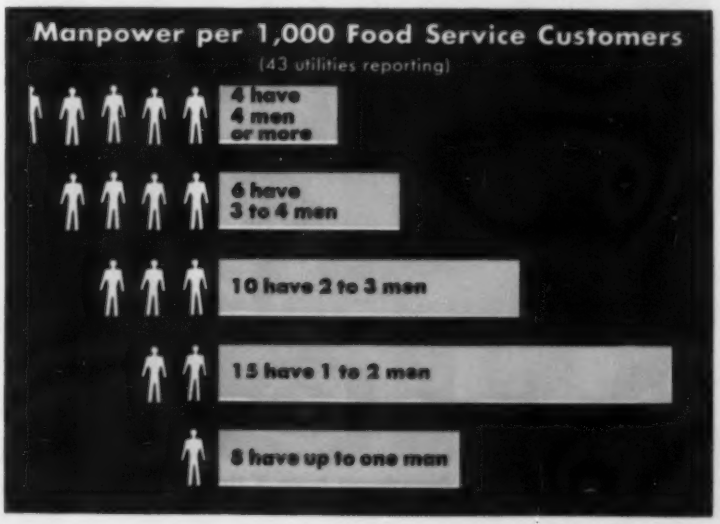
"A guy's got to know what he's doing to sell commercial cooking," says one utility sales executive. "It's one of those businesses where the prospect can know more than you do."

To meet this problem, most successful utilities today follow this recipe: A separate commercial cooking department manned by specialists working year-round, backed by a well-trained, all-purpose sales organization. The all-purpose men act as "bird dogs" to ferret out sales. The specialists follow up. It works, too. Points out one utility: "The all-purpose boys go into a place to sell lighting and refrigeration anyway, why not have them sell commercial cooking, too?"

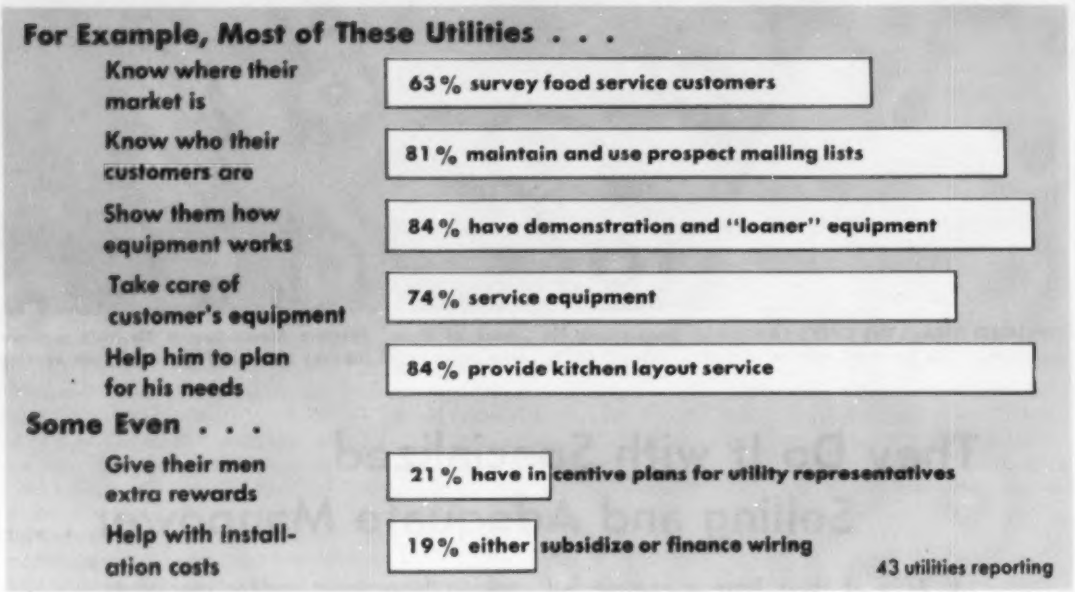
But the secret of success lies in their training. Five years ago it was believed one specialist was enough, even in larger companies. Today there's a trend towards more specialization. Thirtyone utilities in this study have at least one specialist, 16 have two, and seven have between four and eight. In all, 77% have separate commercial cooking departments and/or specialists. Total manpower (including all-purpose men) average 2.14 men per 1,000 accounts. Duke and Northern States Power give major credit to their multiple specialists (both have five) for their rapid growth.

One smaller utility, Kentucky Power Co, uses four specialists to cover as few as 588 customers. With 10,000 kw of commercial cooking load now on its lines, it realizes annual revenues of $333 per account per year—about double what it gets from its small light & power customers.

Conclusion: To make sales, use well-trained men—and enough of them—to contact the full market frequently.


Manpower per 1,000 Food Service Customers
(43 utilities reporting)
4 have 4 men or more
6 have 3 to 4 men
10 have 2 to 3 men
15 have 1 to 2 men
8 have up to one man

Progressive Sales Policies and Practices Back Up Their Men . . .


For Example, Most of These Utilities . . .
Know where their market is
63% survey food service customers
Know who their customers are
81% maintain and use prospect mailing lists
Show them how equipment works
84% have demonstration and "loaner" equipment
Take care of customer's equipment
74% service equipment
Help him to plan for his needs
84% provide kitchen layout service
Some Even . . .
Give their men extra rewards
21% have incentive plans for utility representatives
Help with installation costs
19% either subsidize or finance wiring
43 utilities reporting

Ample, skilled manpower is only part of selling commercial electric cooking. These utilities operate with basic methods and policies that invite commercial cooking sales.

First off, they make the whole sales organization commercial cooking minded. At Pennsylvania Power & Light, 50 all-purpose commercial representatives spend at least 30% of their time on cooking sales promotion. They do the "bird dogging" out in the field. Backing them up is the commercial sales manager; the commercial planning representative who writes programs, handles reports; the commercial cooking supervisor who helps the field close sales on large jobs, prepares kitchen layouts, etc; and the commercial service representative. This last-mentioned man is unique. His primary job is to show chefs how to operate their equipment, make minor adjustments, and help train servicemen to make repairs. He is what the home service woman is to residential customers. He is, for all practical purposes the "home ec boy" of commercial cooking, and PP&L finds he is individually responsible for its highest percentage of sales.

SALESMAN IN THE KITCHEN: Pennsylvania Power & Light's commercial cooking representative or "home ec boy" demonstrates equipment, keeps close to market

Spot Your Market

The organizations studied here use all the solid marketing basics plus a variety of tried and true embellishments. Their initial job is to locate their market. Most of them comb their commercial customers inch by inch to locate the food service prospects. This means getting names and addresses, types of establishments, types of food service, kind and condition of the

equipment, size of existing wiring, and similar data.

Next job is to set up files and classify prospects. They find that the restauranteur already using one or more pieces of electric equipment is the best prospect for new sales. He is "sold" on the electric way and usually has the wiring to handle still more pieces. Two other top prospects: New construction and institutional and in-plant feeding (hospitals, schools, industrial plant cafeterias, etc). The institutionals like the safety and cleanliness features; the in-plant industrials tend to look for the same things in food equipment as in the devices on their production lines, ie, long life, low maintenance costs.

Mailing Lists

From the files of prospects come mailing lists. Through direct mail advertising, they provide continuous contact at only pennies per "call." But they must be kept up to date. Although its initial survey was made five years ago, Appalachian Electric Power has each commercial salesman run a continuous census of his territory.

"There are obvious advantages to this," says Appalachian. "It affords opportunity for the salesman to make systematic contacts (personally and with direct mail) and frequently leads to immediate sales."

"Loaner" Equipment

There is no substitute for demonstration equipment, feels virtually every utility in the study. And each has such a policy: Demonstration equipment for showing prospects how it works; "loaner" equipment to keep service continuous and to build confidence. "Loaners," they find, afford one of the best ways to cultivate good will. An operator with a piece of cooking equipment out of service many times might just as well close shop unless he has "loaner" equipment to carry him through. One company carries 60 pieces of equipment for such emergencies. The expense it says is worth it.

Servicing Equipment

Helping the food service operator to take care of his equipment has been found to play a big part in repeat sales. The utilities in this report know this, and for the most part they extend the service around the clock. In possibly no other area of utility sales is equipment servicing so vital, the customer so dependent.

A PLANNED KITCHEN LAYOUT helped Kentucky Power Co and one of its specialists (above) to oust gas and put 273 Kw of new equipment into this hospital kitchen

Kitchen Layouts

Best way to land an all-electric job, in new construction and complete remodeling contracts especially, is to supply kitchen layouts. This falls in most cases to the commercial cooking specialist. And the competent one is in a position to snare a bonanza (photo above).

Fringe Benefits Sell

A small number of these utilities extend their policies to give extra rewards to their salesmen or to help customers pay installation costs.

Sometimes the salesmen incentives continue throughout the year, but more often during seasonal campaigns. Kansas Gas & Electric, for example, ran a highly successful "Bingo" contest during a recent campaign. Utility reps won cash prizes by making sales to correspond with types of equipment pictured on a special Bingo card. Carolina Power & Light, among others, runs contests with similar interest-building hooks. In one contest it added 6,877 kw in four months, 100% over the quota set.

A few others maintain policies aimed at making wiring costs for the customer as painless as possible. This practice seems to have many pros and cons. Toledo Edison Co, for instance, has offered to finance wiring on time for a number of months but has yet to find a taker. It contends that by quoting installed price plus using selling appeals, you can offset objections to wiring costs.

Still others find the prospect will balk everytime at the thought of paying extra just to get the equipment in and operating. Wiring financing or even subsidies, they say, will return their costs many times over in the form of EAR.

Gulf States this year is limiting its wiring subsidies to heavy duty equipment (up to $8 per kw) after three years of paying costs on all types. It has hopes that increased acceptance of electric equipment, even though it operates in the heart of the gas-producing country, will permit it to discontinue the practice completely before long.

Conclusion: Make the climate right—give your staff the policies it needs to cope with the competition—and sales will follow.

COMMERCIAL ELECTRIC COOKING

. . . . Aggressive Year-Round Promotion Turns Prospects into Buyers

- **Regular contacts, dealer work, and direct mail advertising are basic**
- **But more than that, utilities help the customer and make it easy for him to buy**

Utilities once thought that commercial cooking could be sold by off-and-on selling with a two or three month campaign each year. But those who sell best soon found the competition wasn't sleeping the other nine months. Nor could the buying public be persuaded to compress its purchases into a 90-day period.

Commercial cooking promotion is very much a year-round thing with the utilities studied here. Sure, the seasonal campaigns continue—and with good results—but these utilities go further. They find that results of a campaign live long after the last advertising tearsheet has been interred in the scrapbook. They keep at it the remainder of the year, raking in every last bit of the harvest.

Training

Specialized selling 12 months of the year puts a premium on well-trained men. Nearly every utility examined has some sort of training course for its sales staff. The curriculum: Types of equipment; how they work; how to sell them; repair and servicing; food service problems; and appropriately enough, how to cook. Most courses used are those developed and presented by one of the larger equipment manufacturers.

Dealer Cooperation

On dealer cooperation the agreement is unanimous. As most of the utilities do not merchandise, the dealer must be wooed and won. This courtship takes several tacks:

- The dealer first of all must be convinced that electric cooking can't be beat. One manufacturer explains it this way: "Today's equipment dealer runs, for the most part, a 'department store' operation. He handles all types of equipment and tends to let the customer buy whatever he wants. He sells whatever is easiest. Until he's shown electricity is best, he'll continue to do it that way."
- He must be familiarized with operating costs, wiring installation, electrical heat applications, service policies, etc. To do this, many utility representatives accompany dealer salesmen on calls.
- He is given sales leads. The fairness with which they are allocated often makes or breaks dealer relations. Many gas companies merchandise directly, much to dealers' resentment. The electric utility capitalizes on this.

Contacting Prospects

Again adequate sales manpower is called upon. Those who sell best work the field regularly and completely. Declared a Southeastern company: "It doesn't make sense to sell only one-tenth of the market. We use more men to cover it all."

Many companies, faced with a distance problem, fit up auto trailers with equipment and then take to the road, bringing the equipment to the operator's door. Wisconsin Power & Light Co built its trailer for $250, finds it a good way to train salesmen and to make cold canvass calls.

Prospect Meetings

Tied in with personal contacts are group prospect meetings. Nearly three-quarters of those reporting here hold them at least twice a year.

"It lets you tell a dramatic commercial cooking story as you can in no other way," declares Western Massachusetts Electric's commercial sales chief. "We've had as many as 400 prospects together for one meeting. It's produced a lot of new business for us."

Architect Contacts

There is another important prospect that the smart utility doesn't overlook—the architect, particularly the one who handles commercial and industrial clients. He specifies the kind of equipment that will go into new construction.

Alabama Power Co has a highly effective system of contacting architects. Each is called on; supplied with brochures, testimonials, and catalogs; and put on the mailing list for other material. Company men help him with kitchen layouts, wiring and lighting

LEARNING HOW TO COOK is regular part of training for utility representatives and dealers. Kansas Gas & Electric Co holds "cooker upper" training sessions

HERE'S HOW THEY SELL

All of them . . .	
Work with their dealers	100%
Nearly all of them . . .	
Train their men	98%
Show the buyer how to use and take care of his equipment	98%
Contact all prospects periodically	95%
Contact all architects periodically	93%
Use direct mail advertising	86%
Keep local photo and testimonial files	81%
Most of them . . .	
Give free trials	77%
Hold prospect meetings	72%
Mail "Food Service" magazine to at least half of their customers	71%
Have display equipment and/or model kitchens	58%
Conduct spring or fall sales campaigns	56%
A few . . .	
offer incentives to dealer salesmen	9.3%

43 utilities reporting

problems. He is included in photos and publicity material, invited to group prospect meetings. "To wrap it up," says Alabama Power, "we try to cooperate so thoroughly that it makes it easy and desirable for him to recommend electric cooking."

Direct Mail Programs

If up-to-date lists are used (page 119, direct mail becomes an indispensable sales promotion tool. Nearly all companies in the study have such programs. When used at least quarterly, direct mail provides a natural fill-in between personal calls. A basic mailer, besides those supplied by manufacturers or by the companies, is the monthly magazine, "Food Service." Purchased in bulk by some 71% of the utilities, it is mailed out with their own imprints. Publisher is Electric Information Publications, Madison, Wis.

Another popular advertising wrinkle with local impact is to maintain photo and testimonial files of satisfied local users.

Free Trial Installations

Free trials are the historic method by which the electric industry has broken into the commercial cooking market. This holds true particularly for the fry kettle. Of all electric equipment, it offers the most easily demonstrated superiority over its gas counterpart. Nine out of ten fry kettles that once go into eating places on free trial stay there. One eastern utility put in 2,200 free trial units of various types last year. Relatively few bounced back.

Sales Campaigns

Intensive seasonal campaigns still are the promotional spearhead. Successful ones usually include a heavy barrage of direct mail; contests or other incentives for both utility and dealer salesmen; prospect inducements like free trials, and wiring helps; group prospect meetings, and demonstrations. Many utilities tie-in with manufacturers' promotions such as "Restaurant Roundups" and "French Fry Fiestas."

Dealer Incentives

Directly connected to sales contests are incentive plans for dealer salesmen. The handful who have them (four utilities in this study) for the most part find they do a good job of building dealer interest in electric cooking. Says one utility which has done it: "It seems when you pay 'em, they learn a heck of a lot faster, and work a heck of a lot harder to sell it."

Northern States Power Co each summer stages a three-month Football Party Contest. Those who sell 75 kw or more of connected load during the

GROUP PROSPECT MEETINGS permit utility to show what electric cooking can do at a low sales cost per customer. After demonstration, audience samples the fare

contest join a party to attend a University of Minnesota football game and have a night on the town. Last contest's results: $58,000 in new EAR plus, says Northern States, "good will among dealer salesmen that cannot be measured in dollars." Wisconsin Electric Power Co last year used cash (75¢ to $1.50 per kw added) in a sales-coaxing dealer incentive plan.

Too many dealers wash their hands of the equipment once it is sold, leaving the customer to figure out for himself how to operate and take care of it. To correct this, nearly every utility covered in the study sends its own men out to do the job. He's there when the equipment arrives and stays until the buyer is completely acquainted with it. The satisfied user, they find, makes the best prospect.

It's tough to sell expensive equipment when prospects can't see it first. Too many dealers are still too small to be able to carry adequate stocks of heavy duty equipment. Again, the responsibility falls to the utility, and more than half of them discussed here do it. Union Electric resourcefully uses the kitchen in its employee cafeteria as a demonstration unit; ideal for prospect meetings.

Conclusion: Commercial cooking promotion can't be turned off and on; those who sell best sell every moment.

They Make More as They Spend More In This Vast, Untapped Market

- **Trend is toward higher sales budgets; one spends $150,000**
- **Sales expenses per customer averages $14.94**

Inadequate investment still hampers commercial electric cooking from realizing its full potential.

One eastern utility executive puts it this way: "Commercial cooking won't sell itself, it just won't. It is going to take money. Many utilities have no idea of how much, rather how little, money they're putting into commercial cooking. They're cheating no one but themselves." But those who make the greatest sales, do know what they're spending, and the trend is towards bigger sales budgets.

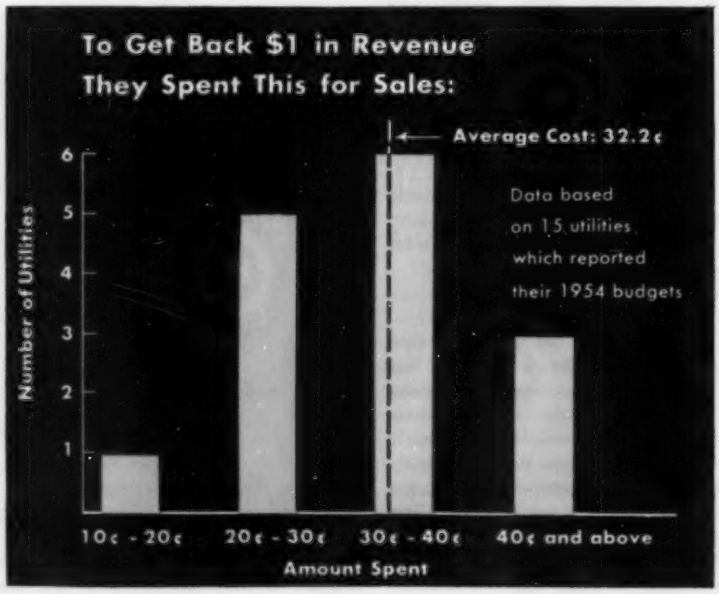
A willingness to keep up with the market as it opens up has caused several utilities to push commercial cooking appropriations far beyond the point which might have been considered the norm in earlier years. Yet they do it for the most part without increasing their sales expense. Mississippi Power & Light Co for instance, budgeted only $8,000 in 1953 and its sales expense hit 57¢ per dollar returned. Last year, it upped it a modest $3,500, boosted its kw rate of growth four times, and reduced sales expense to 22¢.

Classic example when talking budget though is Pennsylvania Power & Light Co. Its $150,000 annual allocation is far and away the highest. But its kw sold and EAR are highest too. As a result its sales expense per dollar of revenue stays down: a reasonable 35¢.

All 15 utilities reporting their commercial cooking expenditures in this study had annual budgets (including salaries) of at least $10,000 last year. Sales expenses per customer ranged from a low of $2.91 to a high of $34.01, while the average centered at $14.94. Amount each spent to make back a dollar of revenue likewise varied, with the average at 32.2¢.

The budget seems to offer the widest point of discrepancy among utilities. Where they ask, is the point of diminishing returns? What should be the guide for appropriations? Wisconsin Power & Light Co uses time required to cover the market adequately as its yardstick. Some contend that if the old rule of thumb holds true to "spend a dollar to make a dollar," then all utilities could afford to enlarge considerably their budgets. "Remember," they say, "once this money is spent and load is added, the revenues continue to come back year after year."

Conclusion: The axiom, "You've got to spend money to make money," is true of commercial cooking.



But Most Vital Is Top-Management Support . . .

Read what these executives say about commercial electric cooking

"182,000 Kw Load"

PHILIP SPORN, President, American Gas & Electric Service Corp, New York

"We have added an estimated 182,000 kw of electric cooking load in the last nine years . . . even though we have competition from low cost natural gas in most of our service area. We are convinced that advantages of electricity over other fuels are more than sufficient to justify its use by our commercial customers. Furthermore, we find that those who use electric cooking are better prospects for other services. We intend to continue to promote it aggressively."

"Diversifies Well"

B. L. ENGLAND, President, Atlantic City Electric Co, Atlantic City, N. J.

"One of the fundamental principles of utility operations is diversification of loads achieved by serving a wide variety of activities. The more diversified they are, the more the impact of rising capital costs are minimized. Commercial cooking load diversifies well with other classes of business and provides us with favorable revenue expressed in terms of system demand responsibility. It is conducive to active promotion as electricity competes favorably with other type cooking fuels."

"Good Annual Load Factor"

G. W. EVANS, President, Kansas Gas & Electric Co, Wichita, Kan.

"Commercial cooking is good for the customer. It fits into the valley of our load curve very well. It has a good annual load factor at unity power factor. It is relatively stable because of the long life of the equipment. And a high percent of its revenue is carried to net income. In addition to this, it offers a large potential market particularly among those customers using air conditioning . . ."

"Offers High Annual Revenues"

ROY S. NELSON, President, Gulf States Utilities Co, Beaumont, Texas

"We are most enthusiastic about our commercial electric cooking sales promotion as the equipment produces a fairly high annual revenue per kw of maximum load and offers the customers many benefits over other types of cooking. We find that we not only have well-satisfied customers where commercial electric cooking equipment is used, but also a greater use of electricity for other purposes."

"Revenues of $2 million"

CHARLES E. OAKES, President, Pennsylvania Power & Light Co, Allentown, Pa.

"Since 1946 we have added approximately 87,800 kw of commercial electric cooking load. We estimate the annual revenue from this load to be in excess of $2 million, equivalent to about 11% of our total commercial revenues. We believe that the sale of electric cooking to commercial customers is an excellent revenue producer, sufficient reason in itself for active promotion of this business. However, we believe that the 'all-electric kitchen' in food service establishments helps sell the 'all-electric kitchen' in more and more homes."

"Improves Percent of Return"

EDWIN VENNARD, President, Middle West Service Co, Chicago

"There are two big reasons why I think electric commercial cooking is the thing to promote: **1.** Our cost analyses of many companies indicate that usually we earn a satisfactory return on this business. **2.** Experience has shown that the good diversity of commercial cooking gives this load a fairly high load factor—generally better than the average commercial load. This adds weight to the fact that percent return is improved by selling commercial cooking. Other reasons: It opens the door to further modernization and better lighting. It builds customers' pride."

HERE'S YOUR BLUEPRINT for commercial electric cooking

ORGANIZATION	Ala. Pwr	App. E P	Atl. City	Car. P&L	Dall. P&L	Det. Ed.	Duke Pwr	Duq. Lt	E. Sh. PS	Emp. Dis E	Fla. Pwr	Gulf Sts.	Hart. E Lt	Inds. P&L	Ind & Mich.
Yrs Comm Cooking Promoted	10	6	7	25	5	8	5	16	6	5.5	10	2.5	27	6	15
No. Food Service Customers*	5,200	3,700	2,000	3,500	1,250	10,300	3,225	5,000	550	496	2,850	1,000	905	1,220	1,700
Has Comm Cooking Department			√				√			√	√	√	√	√	
Has Comm Cooking Specialist	1	4	1	0	2	2	5	1	1	2-40%	2	1	2	1	2
No. All-Purpose Reps	23	21	18	33	10	10	5	19	2	6	12	16	6	0	17
Rep Time on Comm Cooking—%	5	20	30	25	30	15	0	30	5	10	10	15	30	0	20
Man Power per 1,000 Customers	0.41	2.22	3.2	2.36	4.4	0.34	1.55	1.34	2.2	2.8	1.12	3.4	4.19	0.82	3.17
ANNUAL BUDGET															
Sales Exp ($ Thousands)	. . .	. . .	55.0	. . .	. . .	30.0	. . .	. . .	. . .	. . .	19.0	23.0	. . .	. . .	. . .
Sales Exp per Cust-($)	. . .	. . .	26.0	. . .	. . .	2.91	. . .	. . .	. . .	. . .	6.66	23.0	. . .	. . .	. . .
Avg Sales Exp per $1 of EAR-($)	. . .	. . .	0.31	. . .	. . .	0.30	. . .	. . .	. . .	. . .	0.25	0.17	. . .	. . .	. . .
METHODS															
Survey Food Serv Customers	Part	√	√	Part	√		√					Part	√		√
Mail to All Food Serv Customers	Part	√	√		Part	√	√	√	√			√	√	√	√
Demonstration and "Loaner" Equip	Part	√	√	√	√	√	√	√		√	√	√	√	√	√
Service Equip	Part	√	√	√	Part	√	√			√		√		√	√
Kitchen Layout Serv		√	√		Part	Part		Part	√	√	√	√	√	√	√
Incentives for Utility Representatives					√			√		√			√		
Wiring Subsidy-($ per Kw)			5.0							25.0**		5.0		5.0	
Finance Wiring															
ACTIVITIES															
Train Utility Reps	√	√	√	√	√	√	√	√	√	√	√	√	√	Part	√
Dealer Cooperation	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
Contact All Prospects Often	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
Contact All Architects Often	√	√	√	√	√	Part	√	√		√	√	√	√	√	√
Direct Mail (quarterly min)	√	√	√	√	√		√	√	√		√	√	√		√
Free Trial Installations		√	√	√	√	√	√	√		√	√	√	√	√	√
Prospect Meetings (min twice yr)	√	√	√		√	√			√	√	√	√	√	√	√
Spring/Fall Sales Campaigns		√	√	√	√			√		√		√			√
Incentives for Dealer Salesmen				Part				√				√			
Use & Care Instruction to Buyer	√	√	√	√	√	√	√	√		√	√	√	√	√	√
Mail "Food Service" to Most Cust	√	√	√		√			√				√			√
Keep Local Photos, Testimonials	√	√	√	√	√	Part	√	√		√	√	√	√		
Display Equipment or Model Kitchen	Part	√	√	Part			√			√	√	√			√
RESULTS															
Comm Cooking Kw Added	2,729	15,635	8,004	10,402	1,200	4,174	10,163	6,499	400	526	6,193	4,572	2,259	1,762	5,011
New Comm Cooking EAR-($ Thousands)	48.2	391.0	158.1	207.0	27.5	100.2	254.1	130.0	10.0	30.8	76.7	137.2	70.7	51.5	120.3

√—Yes (Blank means No)
Part—Partial

. . .—Data not available
†—Sends own publication

. . . a detailed outline of what the utilities in this study did last year to sell it

ORGANIZATION	K. C. P&L	Kan. G&E	Ky. Pwr	L. A. W&P	La. P&L	Met. Ed.	Miss. P&L	Mont. Pwr	N. Eng. E Syst.	N. J. P&L	N.Y.S. E&G	North Sts.	Ohio Ed.	Ohio Pwr
Yrs Comm Cooking Promoted	17	5	26	25	2	21	3.5	36	21	24	27	5	18	23
No. Food Service Customers*	2,500	1,079	588	5,000	1,150	2,500	761	2,000	4,700	561	2,000	5,000	4,650	3,037
Has Comm Cooking Department			√	√								√	√	
Has Comm Cooking Specialist	1	1	4	5	0	0	0	2	5	0	0	5	2	0
No. All-Purpose Reps	16	13	4	30	29	15	18	11	36	5	23	10	27	65
Rep Time on Comm Cooking—%	2.5	15	25	3	4	20	5 to 10	10	5	30	7	10	10	20
Man Power per 1,000 Customers	0.56	2.73	8.5	1.18	1.01	1.2	1.77	1.55	1.46	2.67	0.89	1.2	1.0	4.27
ANNUAL BUDGET														
Sales Exp ($ Thousands)	. . .	. . .	20.0	43.7	. . .	. . .	11.5	. . .	. . .	. . .	15.0	. . .	. . .	. . .
Sales Exp per Cust-($)	. . .	. . .	34.01	8.74	. . .	. . .	15.10	. . .	. . .	. . .	7.50	. . .	. . .	. . .
Avg Sales Exp per $1 of EAR-($)	. . .	. . .	0.47	0.51	. . .	. . .	0.22	. . .	. . .	. . .	0.35	. . .	. . .	. . .
METHODS														
Survey Food Serv Customers			√				√		√	√	√	Part	Part	√
Mail to All Food Serv Customers	√	Part	√			√	√	√		√	50%	√	Part	√
Demonstration and "Loaner" Equip	√	√	√	√	√		√		√	√	√	√		√
Service Equip	√		√	√				√	√		√	√	Part	√
Kitchen Layout Serv	√	Part	√	Part		√	Part	√		√	√	Part	√	√
Incentives for Utility Representatives		√			√		√							√
Wiring Subsidy-($ per Kw)				4.0										
Finance Wiring									√					
ACTIVITIES														
Train Utility Reps	Part	√	√	√	√	√	√		√	√	√	√	√	√
Dealer Cooperation	√	√	√	√	√	√	√	√	Part	√	√	√	√	√
Contact All Prospects Often	√	√	√	Part	√	√	√	√		√	√	√	√	√
Contact All Architects Often	√	√	√	√	√	√	√	√		√	√	√	√	√
Direct Mail (quarterly min)	√	√	√		√	√	√	√	√	√	√		√	√
Free Trial Installations	Part	√	√		√	√	√		√	√		√		√
Prospect Meetings (min twice yr)		√	√	√	√	√	√			√		√	Part	√
Spring/Fall Sales Campaigns		√	√	√	√		√		√		√	√		
Incentives for Dealer Salesmen														
Use & Care Instruction to Buyer	√	√	√	√	√	√	√	√	√	√	√	√	√	√
Mail "Food Service" to Most Cust	√	√	√	√	11%	40%	√	√	√	√	√	√	45%	√
Keep Local Photos, Testimonials		√	√	√		√	√		Part	√	√	√	Part	Part
Display Equipment or Model Kitchen		√	√			√	√	√	Part	√		√	Part	√
RESULTS														
Comm Cooking Kw Added	1,800	1,896	2,131	5,250	400	5,000	1,722	. . .	8,499	1,137	3,475	9,812	9,037	11,812
New Comm Cooking EAR-($ Thousands)	45.0	60.7	42.6	86.3	10.0	100.0	51.7	. . .	196.0	15.7	59.2	233.9	. . .	225.1

*Definition of a food service customer varies with individual companies; ie, some limit prospects to those who serve a meal, others broaden market to include donut and coffee stands.
**For three kw or more

More utilities and their selling methods on the concluding page

COMMERCIAL ELECTRIC COOKING

UTILITIES' BLUEPRINT . . their policies, activities, results

ORGANIZATION	Okla. G&E	Omha PPD	Pa. P&L	Pot. Ed.	S. Cal. Ed.	Tol. Ed.	Union E Mo.	Unit. Illum.	Utah P&L	Wash. W P	W. Mass. Elec.	West Penn.	Wisc. P&L	Wisc. P S
Yrs Comm Cooking Promoted	16	31	8	30	23	8.5	28	9	26	. . .	4.5	22	9	20
No. Food Service Customers*	5,250	600	5,000	1,400	8,800	910	5,000	2,600	1,210	700	698	2,880	1,070	789
Has Comm Cooking Department	√		√		√	√	√		√				√	√
Has Comm Cooking Specialist	1	1	2	1	8	1	2	0	0	0	0	1	1	0
No. All-Purpose Reps	8	12	50	7	84	3	52	5	17	12	5	20	23	10
Rep Time on Comm Cooking—%	10	5	30	33.33	5	5	5	50	25	10	20	25	8	30
Man Power per 1,000 Customers	0.34	2.66	3.4	2.38	1.38	1.25	0.92	0.96	3.51	1.71	1.43	2.1	2.65	3.8
ANNUAL BUDGET														
Sales Exp ($ Thousands)	26.0	10.0	150.0	. . .	63.2	12.1	. . .	28.0	. . .	. . .	. . .	. . .	22.0	. . .
Sales Exp per Cust-($)	4.95	16.66	27.2	. . .	7.18	13.29	. . .	10.76	. . .	. . .	. . .	. . .	20.18	. . .
Avg Sales Exp per $1 of EAR-($)	0.28	0.34	0.35	. . .	0.30	0.24	. . .	0.46	. . .	. . .	. . .	. . .	0.30	. . .
METHODS														
Survey Food Serv Customers	√	√	Part	√		√	√	√		√	Part			√
Mail to All Food Serv Customers	√	√		√		√	√	√	√	√	√	√	√	√
Demonstration and "Loaner" Equip	√	√	√	√	√	√				√	√	√	√	√
Service Equip	√	√	√	√	√	√			√	√	√	√	√	√
Kitchen Layout Serv	√	√	√	√	Part		Part	√		√	Part	√	√	√
Incentives for Utility Representatives													√	
Wiring Subsidy-($ per Kw)				. . .										
Finance Wiring						√				√				
ACTIVITIES														
Train Utility Reps	√	√	√	√	√	√	√	√	√	√	√	√	√	√
Dealer Cooperation	√	√	√	√	√	√	√	√	√	√	√	√	√	√
Contact All Prospects Often	√	√	√	√		√	√	√	√	√	√	√	√	√
Contact All Architects Often	√	√	√	√		√	√	√	Part	√	√	√	√	√
Direct Mail (quarterly min)	√	√		√	√	√	√	√	√	√	√	√	√	√
Free Trial Installations	√	√	√	√	√	√					√	√	√	√
Prospect Meetings (min twice yr)	√	√	√		√		√				√	√	√	Part
Spring/Fall Sales Campaigns	√	√					√		√	√	√	√	√	
Incentives for Dealer Salesmen											√			
Use & Care Instruction to Buyer	√	√	√	√	√	√	√	√	Part	√	√	√	√	√
Mail "Food Service" to Most Cust	6%	†	√	√	√	√	√	√	√	√	√	√	√	√
Keep Local Photos, Testimonials	√	√	√	√	√	√	√	√	√	√	√	√		
Display Equipment or Model Kitchen	√			√		√	√		Part					√
RESULTS														
Comm Cooking Kw Added	2,989	1,644	16,869	3,911	6,900	2,023	4,599	1,532	2,746	3,875	1,907	5,657	1,481	1,314
New Comm Cooking EAR-($ Thousands)	92.4	29.6	422.0	109.4	213.0	50.6	138.0	61.3	56.3	56.6	50.2	138.9	57.0	29.5

For symbols see page 124

Mechanic closes network protector switch and makes the Daily News the first customer in New York where . . .

265/460-V Service Is Offered by Con Edison Co of N.Y.

The first 265/460-v service made available by Consolidated Edison Co in New York City now is being supplied to the printing plant of the New York Daily News. Service at this voltage was offered to commercial and industrial customers for the first time in February 1954. The installation of a new press load at this plant warranted the 460-v service. Voltage to the plant is provided through three 27,000-265/460-v transformers each rated 2,000 kva.

Special thought was given to the design and layout of the electrical apparatus in the network compartment to make certain that there would be room to work safely around the bus sections and network protectors. Future 460-v installations will be based on these special studies.

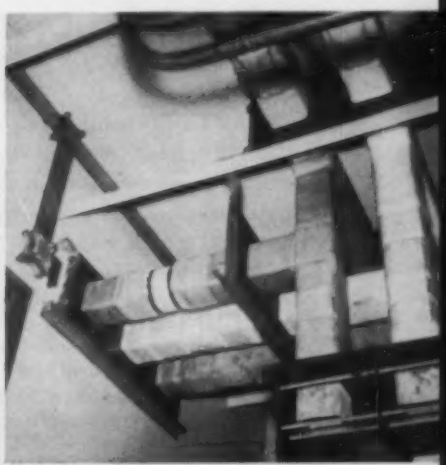
Wooden dummies of network compartments were constructed to facilitate these studies. They were made full-scale to exact dimensions. Wooden models of network protector switches and bus sections were also assembled and installed exactly as they would be in a real network compartment. The final layout was approved by both the design engineers and the field construction men.

By using the scale model it was discovered that the square tube bus sections were too close together. This was rectified in the final bus design.

Optimum Set-Up Under Study . . . The same mock-up approach is being used to work out satisfactory network compartment designs for 265/460-v service installations in three new city buildings now under construction. Service for these will be provided right from the start at the higher voltage instead of at the customary 120/208 v.

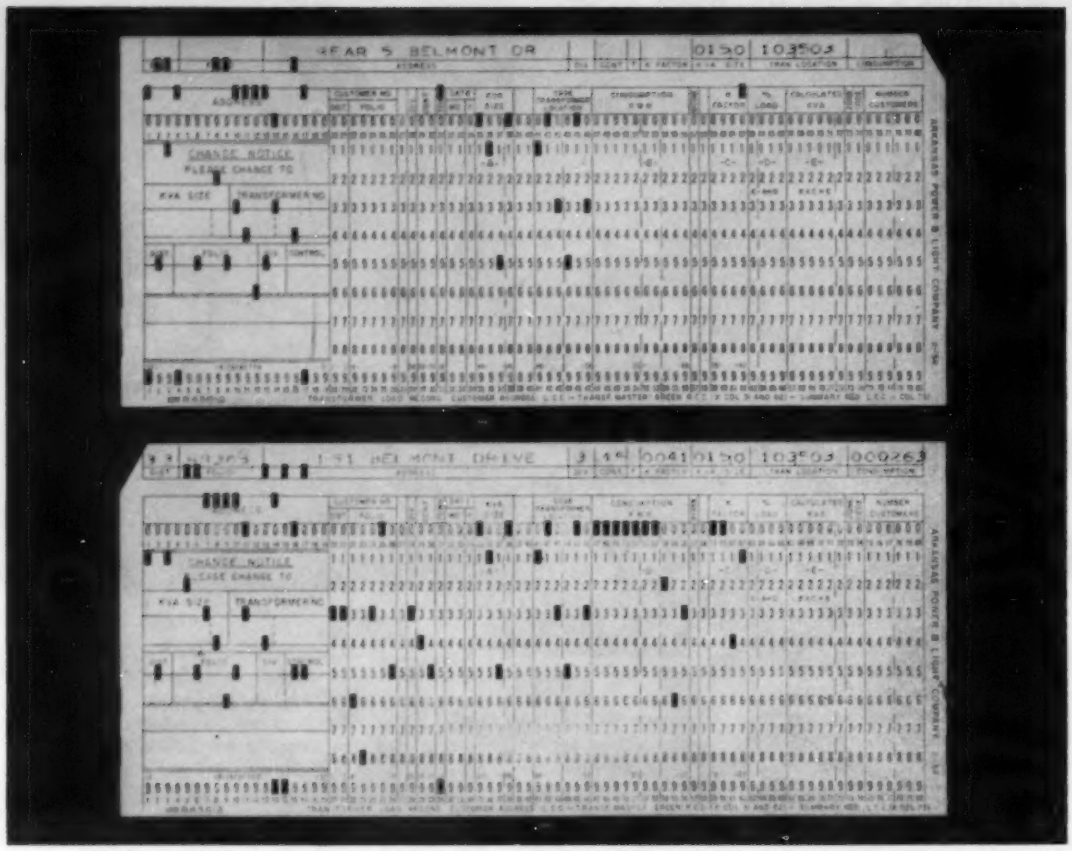
Each new network compartment mock-up reflects the continued efforts of Consolidated Edison Co engineering departments to improve these installations. One of the layouts now being worked out probably will represent the optimum set-up on which future 265/460-v network compartment designs can be standardized.

FULL-SCALE plywood model of 265/460-v network protector and bus work are examined by engineers. Fuses are represented on bus by black bands



SCALE MODEL VERSION of bus and customer's take-off structure aided engineers in establishing a final design which had wider phase spaces

These cards . . .



TABULATING CARDS (LIKE ABOVE) FOR TRANSFORMERS HAVE CUSTOMER CARDS (BELOW) ASSEMBLED BEHIND THEM

Computers Gauge Transformer Load

H. E. STRATTON, Ebasco Services Inc., New York, N. Y.

R. H. JOERDEN, Arkansas Power & Light Co, Pine Bluff, Ark.

B. M. GALLAHER, Texas Electric Service Co, Ft. Worth, Tex.

Statistical load checking of distribution transformers by machine accounting methods, using customer kilowatt hour records, is being practiced successfully by Texas Electric Service Co and Arkansas Power & Light Co. Results of several hundred actual load tests and comparison of calculated load with measured load prove the method more accurate than any practical plan available for measuring transformer loads.

This comparison showed that 5% of the calculated loads were exactly the same as measured loads, 60% within 10% of measured load, 92% within 20%, and all within 25%. And experience with statistical load checking of distribution transformers affords the following advantages:

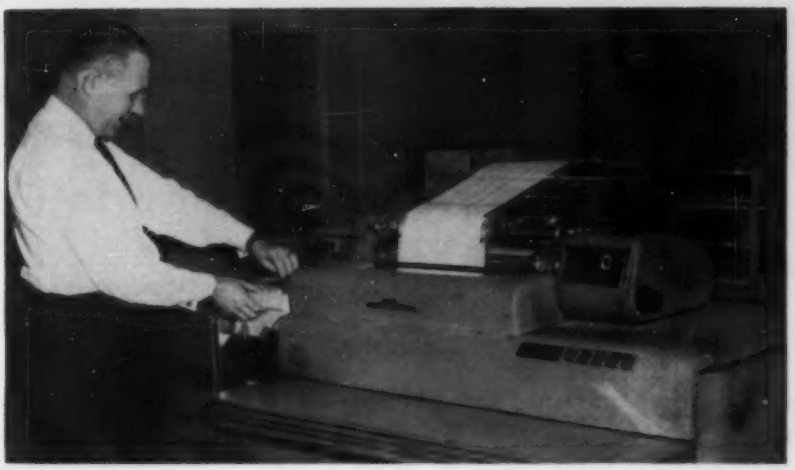
1. Loads that occur for a relatively short period can be estimated.

2. Overloaded transformers and secondaries can be corrected in an orderly fashion prior to the following peak-load period.

3. Records of each transformer-secondary combination become a tool for the distribution engineer for his use throughout the year as new loads, changes, and complaints occur.

The calculated transformer load information on all residential distribution transformers can be used in calculating voltage drops on each secondary to ascertain that they are within prescribed limits. Although this is done manually now, investigation indicates that addition of two more factors to transformer header cards will make practicable the secondary voltage drop calculation by means of account-

fed into this machine →



Produce these results . . .

ARKANSAS POWER & LIGHT COMPANY
TRANSFORMER LOAD REPORT - EL DORADO - NOV. 1954

Transf. Code	KVA Size	KWH Block	No. Custs.	Conv. Factor	KWH Consumption	Calc. KVA	% Loading
176501		1	5	40	570	23	
176501		2	6	36	2262	81	
	100		11		2832	104	104 *
176502		1	8	40	804	32	
176502		2	13	36	4106	148	
	150		21		4910	180	120 *
176503		1	11	40	1320	53	
176503		2	12	36	5294	191	
176503		3	3	29	3270	95	
	150		26		9884	339	225 *

REPORT SHEET FROM ACCOUNTING MACHINE SHOWS TRANSFORMER LOCATION, SIZE, CONVERSION FACTORS, ETC

ing machines. This could be done at the same time transformer loads are calculated, and results would appear in percent voltage drop in an additional column on the report sheet.

The recent rapid increase of load from all types of air-conditioning equipment during the past few years has accentuated the need for an easy and reliable method of determining loads on distribution transformers.

Most utilities have transformer load testing programs which often consist of taking current readings at transformer terminals with indicating meters or installation of maximum indicating meters for a 24 or 48-hr period. These programs served their purpose before the rapid growth occasioned by air conditioning load. It was usually practicable then for a utility to get around to all transformers in four-to-five years, and the "cushion" designed into transformer-secondary combinations normally took care of the load growth in the interval. Such a program, although its cost per transformer was high, had a low annual cost as any one transformer load was measured only once in five years.

Air conditioning loads, however, made the limitations of such a program apparent. Load growth on a particular transformer often became such that the "design cushion" disappeared in a year or less. Peak load was on considerably fewer hours during the year. And the same manpower and equipment could test fewer transformers. Several consecutive days of maximum-temperature weather can bring load to its peak. Chances of measuring load at peak with any except permanently installed recording meters are very poor.

The magnitude of the problem is obvious when measuring loads on Ft. Worth's 11,000 transformers is considered in terms of manpower and equipment. Indicating meters, read between 7 and 9 AM on days when the temperature there exceed 100 F, gave about 85% accuracy of the true transformer peak.

Transformer Failures . . . During the summer of 1951 the problem became acute in Ft. Worth. Rapid residential load increase brought an alarming number of transformer failures. Associated troubles caused by low voltage and service interruptions were numerous.

Texas Electric Service decided to investigate the feasibility of determining load on transformers from known monthly kwhr output of the transformers, using automatic

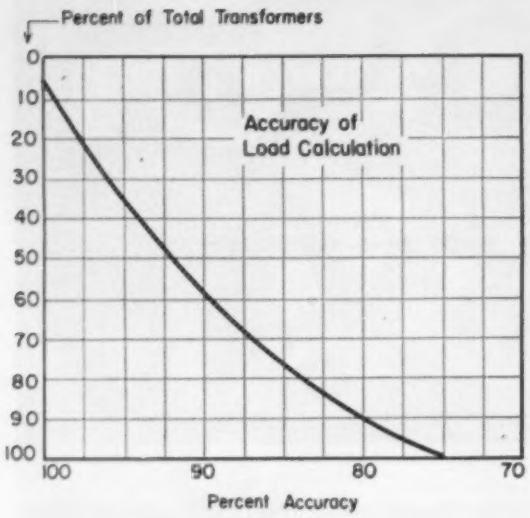


FIG 1—RELATIVE ACCURACY of kwhr method of determining distribution transformer loads was checked by extensive tests

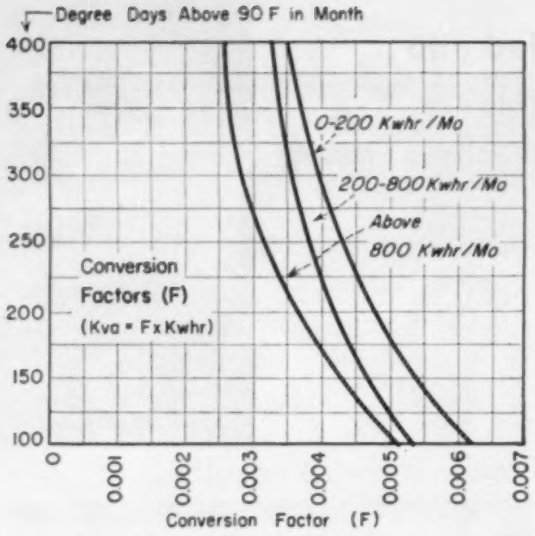


FIG 2—CONVERSION FACTORS relate kwhr to kva for degree-days over 90 F per month for different kwhr-use groups

accounting machines to assemble the kwhr-per-transformer information and converting it to transformer kva demand. Fortuitously, the utility was then installing punch-card machine accounting for customer billing, and the feasibility of extending its use was investigated.

Relating Kwhr to Kw . . . To determine kw or kva demand from kwhr transformer output, the load factor of a group of customers supplied must be known. To establish average load factor for a given area, it must be assumed that the load factors of various groups of residential customers in that area do not vary greatly.

During the past three summers, Texas Electric tested many transformers in Ft. Worth and Wichita Falls, and Arkansas Power & Light in Little Rock, Pine Bluff, and other Arkansas cities. These tests revealed a considerable variation in the load factors of transformers in a given area, indicating that use of an average load factor for all transformers in an area would not give accurate results in calculating transformer loads.

But this accuracy, it was found, could be improved when different load factors for low, medium, and high kwhr-use customers were employed. After the utilities had experimented on a "cut-and-try" basis, they divided their customers into groups consuming 0 to 200 kwhr, 200 to 800 kwhr, and over 800 kwhr per month. A different load factor was then used for each group.

As loads and load factors vary considerably for different temperature conditions, load factors must reflect such temperature conditions during the time of kwhr consumption. The companies prepared curves from the test data obtained over three years, plotting conversion factors against degree-days for a month or other billing period. In the curves used by Arkansas Power & Light, Fig 2, a separate curve represents each kwhr-use group.

Machine Setup . . . The system is practicable only where customer billing is by punch-card machine accounting. In setting up the system, the first and most difficult job is identification of each customer with a particular transformer. It has proved expedient to add services and service addresses to existing distribution maps showing transformers and secondaries. This requires a field survey.

When a location number has been assigned to each transformer, a tabulating card is key punched for descriptive location, location number, and transformer kva size. A deck of customer address cards from the machine accounting department is then punched with customer account numbers and service addresses. The cards, arranged in account number or billing order, are hand sorted from account to transformer location order so that each can be placed behind the proper transformer card.

This being completed, the cards are returned to the machine accounting department, and the location numbers from the transformer cards are intersperse-punched into the customer cards behind them. The setup is then completed, and load calculations can be run.

This card file, kept in the engineering department, is sent to the machine accounting department only when a transformer load calculation is desired.

Machine Processing . . . When the transformer load record card file is received in the machine accounting department, address cards are sorted from transformer-location to account-number order. The billing cards for the month being used for the load calculation are next collated or matched in front of the transformer-address cards by account number, and unmatched billing cards are selected.

Selected billing cards, ie, billing cards for which there are no matching cards in the transformer card file, must be reproduced, assigned location numbers, and inserted in their proper places in the file. This procedure makes it possible to ignore new accounts, thereby simplifying day-to-day maintenance of the transformer card file.

After the billing cards are placed in order, kwhr con-

(*Continued on page* 216)

Insulation, Shielding Changes Improve Line Performance

Lightning outages on Toledo Edison Co's 69-kv system have been eliminated. Formerly, outages numbered 24.5 per 100 miles per year

H. H. DUGAN Jr, Transmission Design Engineer, Toledo Edison Co, Toledo, Ohio

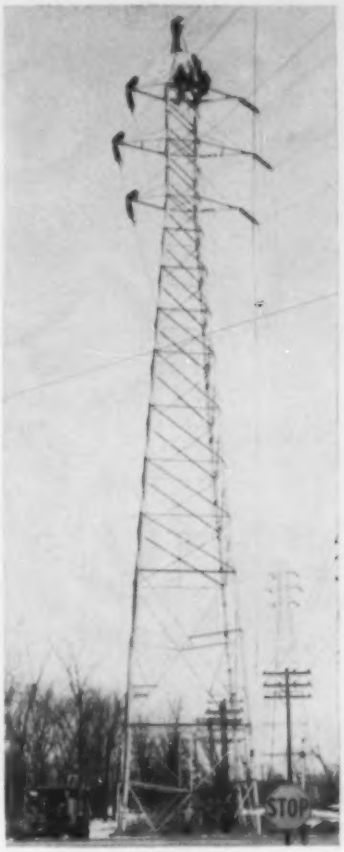
Installation of additional insulators and better line shielding has greatly improved performance on the 69-kv Belt Line which forms the backbone of Toledo Edison Co's system. Since the improvements were made, no lightning outages have occurred, whereas, 24.5 outages per 100 miles per year was the previous recorded rate.

Insulation consisted of five 4¾ by 10-in. discs on one circuit and six discs on the other circuit for suspension assemblies with one additional disc on strain assemblies. These were changed to eight discs per suspension assembly, the maximum obtainable with an equivalent air gap to ground, based on a 1½ x 40-microsecond wave. This work was completed in 1952 and outages were reduced from 24.5 per 100 miles per year (40 thunderstorm days) to 16.1 per 100 miles per year (40 thunderstorm days).

Increased insulation was followed in 1954 with improved shielding. Tower tops were rebuilt to raise the shield wire, changing the shielding angle from 52 deg to 30 deg. Six different designs were required to fit the various types of towers. Since the improved shielding was provided there have been 28 lighting storm days and no outages.

Ground resistances on these lines are good, averaging two ohms and not exceeding five ohms. The actual outage record before the insulation improvement was three times the calculated expected outages (See table). Increased insulation reduced expected outages from 8.4 to 5.6 per 100 mi per year, but the actual outage record of 16.1 was still almost three times the calculated expected outage rate of 5.6. This has led to the belief that the stroke-current probability curve for the company's service area is somewhat higher than the published national average.

Growing loads and the requirements of greater service reliability prompted the studies that led to this improved transmission line performance. Many industries today suffer severely during curtailed production when there is even a momentary lightning outage. In the Toledo area this is particularly true of such industries as the glass and petroleum refining industries.



REBUILDING TOWER TOPS changed shielding from 52 deg to 30 deg and improved the lightning performance of 69-kv line

69-Kv Belt Line Lightning Performance

Year	Number of Lightning Outages	Miles of Exposure	Number of Thunderstorm Days	Design outages Expected per 100 miles per year (40 Thunderstorm Days)	Actual Outages Experienced per 100 miles per 40 Thunderstorm Days	Ave. Act. Outages experienced per 100 miles per 40 Thunderstorm Days
1947	10	32.7	51	8.4	24.0	24.5
1948	6	32.7	35	8.4	21.0	24.5
1949	3	32.7	39	8.4	9.4	24.5
1950	7	32.7	42	8.4	20.4	24.5
1951*	10	33.9	33	8.4	35.8	24.5
1952**	8	35.1	25	8.4	36.4	24.5
1953	7	35.1	40	5.6	20.0	16.1
1st half of 1954	2	35.1	27	5.6	8.4	16.1
7/1/54–9/1/54***	0	35.1	13	2.2	0	

*—L.O.F. Rossford line added to Belt Line exposure.
**—Insulation increased from 5- 4⅝ in. units to 8- 4⅝ in. units.
***—South Belt towers repeaked.

(*More How To on page* 136)

ENGINEERS WILL PREFER the new G-E cutout. It meets practically all cutout needs. One housing and four interchangeable doors offer maximum flexibility and maximum economy.

G.E.'s ALL-NEW LINE OF

SAFETY-GRIP DOOR means fumble-proof handling with a conventional switchstick, as well as easy manual handling of door with gloved hand, from right, left, or below.

"V" WEDGE CONTACTS combine all the requirements for long service life. Unique construction enables positive high-pressure, multi-point, low-resistance surface contact.

COMPRESSION CLAMPING of hanger support gives maximum durability. Mechanical and thermal tests show support withstands stress and strain far beyond normal service.

LINEMEN WILL LIKE the new G-E cutout. It is easy to use with many new features like the safety-grip door with natural thumb-and-finger holes and the easy-to-open shipping box.

ENCLOSED FUSE CUTOUTS

Now available in 50- and 100-amp ratings 5.2 and 7.8 Kv

General Electric's important new fuse cutout development offers new economies and safety features. Every standard need is satisfied by four doors which are *interchangeable in one basic housing.*

The new G-E Enclosed Fuse Cutout supersedes three former lines: Enclosed, Indicating and Drop-out; Non-indicating Enclosed and Heavy-duty Enclosed (except the 200-ampere rating). When you standardize on this new line you stock fewer parts, inventories are smaller, storage and handling costs are less.

The many desirable features in the new line were based on hundreds of reports collected by G-E engineers. To name just a few besides the features shown graphically at the left, you'll find fusing is simplified, line terminals are tin-plated to minimize corrosive effects, and neoprene barriers help protect against internal flashovers.

For more information get in touch with your nearest G-E Apparatus Sales Office or Agent. Or write for Bulletin GEA-6028 to General Electric Company, Section 433-8, Schenectady 5, New York.

Progress Is Our Most Important Product

GENERAL ELECTRIC

DISTRIBUTION
TRANSFORMERS
ATANA*

2. EASIER TO CHECK—
NEW HANDHOLE DESIGN

1. EASIER TO HANDLE—
BECAUSE THEY'RE LIGHTER

Picture story of a lineman making

BIG SAVINGS ON INSTALLATION

Time and money can be saved when installing distribution transformers. Ask the man who puts them on the pole! He'll tell you that General Electric transformers make his job easier in four ways.

Easier to handle. Lighter weight of G-E transformers means easier handling in warehouses, on trucks, and where it counts most—on the pole. Since 1937 G.E. has cut the weight of many ratings almost in half!

Easier to check. Only a screwdriver is needed to remove or tighten the single bolt which holds the one-piece cover band and the handhole cover. The nitrile rubber gaskets—another G-E exclusive—can be re-used again and again.

Handles copper or aluminum. No special fittings are needed because tin-plating of the terminals and built-in spring tension lick both the corrosion and the "cold-flow" problems of aluminum conductor.

More clearance, G.E. has shrunk sizes as well as weights. Lower heights mean big dollar savings because existing transformers can be replaced by larger ratings without changing poles. 431-21

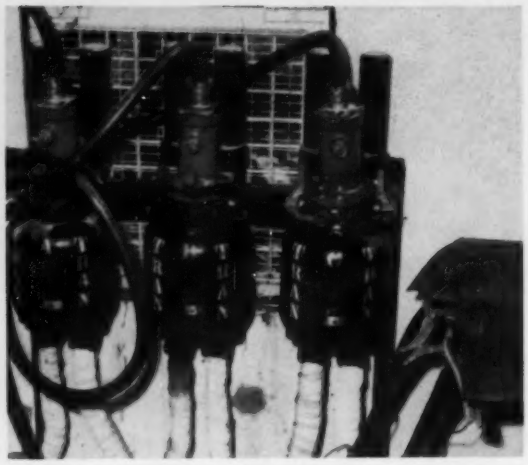
CONVENTIONAL—SELF PROTECTED
take your choice
General Electric makes both

*ATANA. Your linemen probably know better than anyone else that *All Transformers Are Not Alike.* General Electric Company, Schenectady 5, New York.

Progress Is Our Most Important Product

GENERAL ELECTRIC

DEADEND STRUCTURE having telescoping pipes and mounted on top of trailer can be lowered by one man with a hand-operated winch



PROBE-TYPE POTHEADS that insert into oil fuse cutouts are used to tap UG primaries. Stress cone connections are shown at right

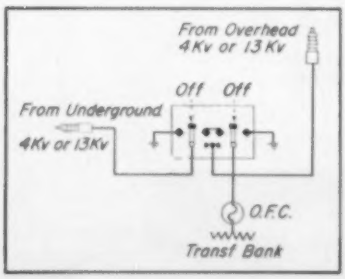
Transformer Trailer Cuts Operating Costs

GORDON D. READ, Junior Engineer, Florida Power & Light Co, Miami, Fla.

A new transformer trailer for use during underground work has been built by Florida Power & Light Co. It contains three 167-kva transformers and everything necessary to connect them up except secondary cable, which is hauled in a separate trailer. In addition to providing better service, the unit reduces operating costs by:

1. Shortening customer outage time.
2. Allowing splicers to work without interruption.
3. And eliminating need for building more vault space by permitting vaults to be stripped and rearranged without interrupting service.

The transformers have 4-5% taps below normal and series paralleling switches for 4-kv and 13-kv operation. Underground primary circuit parts were used instead of the overhead type for greater personnel safety. A set of oil cutouts fuse the transformers, and an oil switch controls the unit. Pothead terminations facilitate connections to underground and overhead feeders with 15-kv paper-insulated, lead-covered cable.



PRIMARY CONNECTIONS of 4 or 13 kv are made to transformer through an oil switch

An elevating deadend on telescoping pipes was provided for overhead connections. One man raises and lowers the deadend with a hand-operated winch. Potheads receive the open wire through the trailer roof.

For underground terminations, 480 ft of No. 2, 133-strand, rubber-insulated, 15-kv cable with basket weave shielding is wound on each of three wooden reels located in the back of the trailer. There are stress cone terminations on each end of the cables with the inside termination protruding from the side of the reel just long enough to reach the inside potheads.

Probe-type potheads that insert into oil fuse cutouts are used to tap the primary in the vault. Twenty feet of flexible cable extends from the probes and terminates in stress cones. Stress cones from the reels and probes are brought together inside a high-voltage, plastic, transmission line guard which is then secured in a dry place.

Clamps placed on each end of the guard prevent terminations from being pulled out accidentally. When not in use, probes are carried in oil-filled containers in the trailer.

Transformer secondary terminals are connected to an ebony asbestos panel board. The board is an arrangement of studs connected by links. Variation of the links provide the desired 3-phase voltages of 120/208 wye, 120/240 delta, and 277/480 wye. Cables from the terminal board connect with a secondary bus metered by current transformers to provide kwhr and 15-min demand metering. A voltmeter and ammeter are also installed for operational checks.

A two-wheel utility trailer carries a ton of 4/0 secondary cables on four reels. Cables are made up in 75-foot lengths with either-end connectors soldered to each end. Connectors permit continuous winding on the reels and only the required number of cables need be unwound for a specific job.

The transformer trailer can be pulled by a tractor for easy maneuverability and long distance hauling. For local operations, the trailer is equipped with a dolly for pulling by a line truck.

Some problems have been encountered. Heating has been experienced when operating the flexible primary cable from 4-kv system with more than 75% of the cable on the reels. This is overcome by de-rating the cable. Handling of the probes is difficult because each weighs 30 lb.

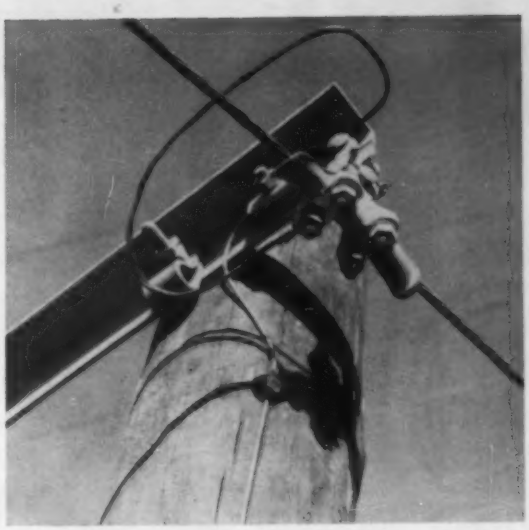
It is believed that the unit will not require attendance, although stand-by men are being provided until more operating experience has been gained.

New Support and Assembly Ground Static Wires

J. C. CLAUGHTON, JR, Engineer
HAROLD N. WRIGHT, Engineer, Transmission Dept., Southwestern Public Service Co, Amarillo, Texas

An angle-iron support and a grounding assembly for static wires on H-frame construction provide positive grounding, cut material cost, and increase conductor and structure shielding. The support and assembly, designed by Southwestern Public Service Co for 66 and 115-kv lines, also make the installation easier, add structure rigidity, and have a low radio interference level. Company lines using the support and assembly have a very satisfactory performance record.

Conductor sizes on these lines range from 1/0 to 397,500 cir mils ACSR, with two $\frac{7}{16}$-in. EHS galvanized-steel static wires. The H-frame structures have a conventional double-timber arm and are X-braced for most applications.

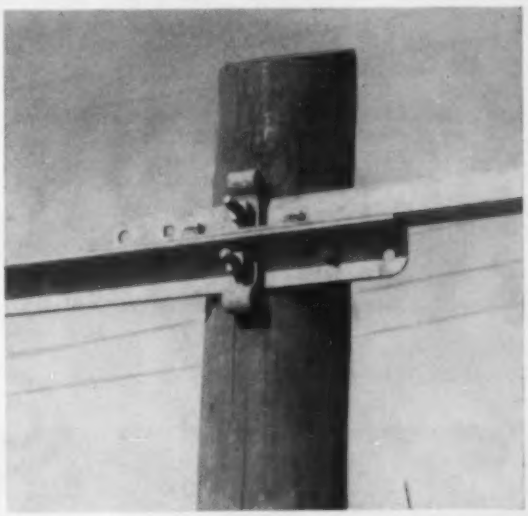


POSITIVE GROUNDING of static wire and angle support is provided by special assembly. Jumper is shaped to eliminate fatigue breaking

Installing Assembly . . . Shield-wire assembly consists of an angle iron support to which static wire suspension clamps are attached with anchor shackles. The steel angle is fabricated and galvanized to specifications from standard 2½ x 2¼-in. stock. The 2½-in. side is drilled or punched before galvanizing.

Mounting holes, $\frac{13}{16}$-in. for $\frac{5}{8}$-in. machine bolts, are 9 in. from the end of the angle. Punched $\frac{7}{8}$-in. square holes are 4 in. from the end for ½-in. carriage bolts that hold the bonding clamps. And $\frac{13}{16}$-in. holes are drilled 1 in. from the end for hanging the static wire suspension clamp. Ends of the angle on the 2½-in. side are rounded for appearance and to allow the suspension clamps to swing free.

The support angle and static wire are bonded to the structure ground with standard clamps and lugs and a stranded copper jumper. Cost of the support delivered to project sites is about $7.50. Installation labor is minimized because the support is attached by only two machine bolts with spring washers and locknuts. For three-pole H-frame structures, two angles are spliced at the center pole (as illustrated) with two $\frac{5}{8}$ x 2-in. machine bolts and locknuts.



FOR THREE-POLE STRUCTURES angles are spliced at the center pole. Standard stock angles are punched and drilled, then galvanized

Limitations of Support . . . The steel angle static support is limited in two respects. Although these steel angles are weaker in compression than in tension, it is highly improbable on X-braced H-frame structures that sufficient transverse load unbalance could occur which would cause permanent angle distortion or bending.

The angle iron does not have sufficient strength to sustain, without bending, the unbalanced longitudinal pull resulting from failure of a fully loaded static wire. But such an action assumes a rigid structure. Actually, the structure would most probably "wrack out" with little or no bending of the angle support. And the slight probability of such adverse circumstances does not justify increasing the strength of the angle.

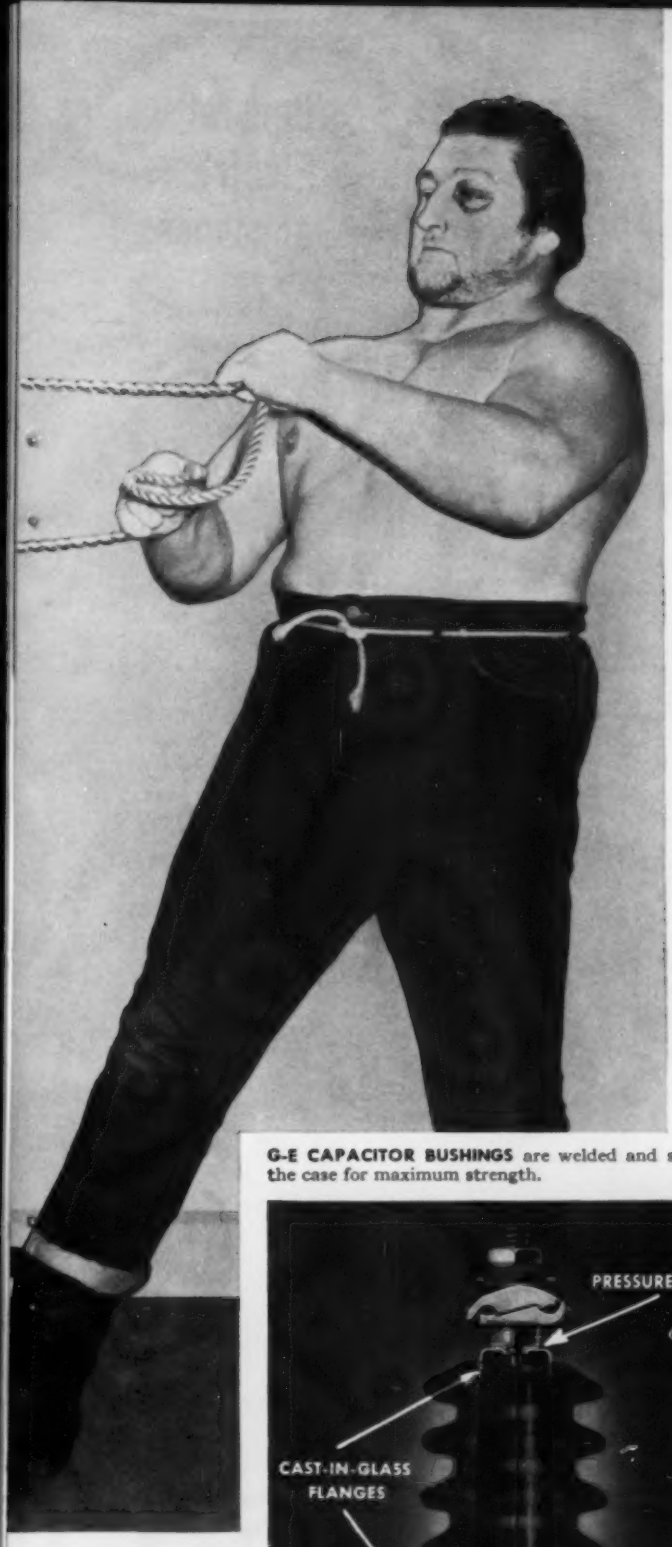
Atmospheric conditions and industrial contamination are largely responsible for development by Public Service of a direct connection of the static wire to the structure ground. The Southwest experiences rather high dust contaminations accompanied by high winds. In addition, there are areas where sour gas or other industrial residues contaminate the air.

The copper-clad pole ground is spliced to the stranded copper jumper with a compression sleeve held by a cable suspension (bonding) clamp on the support iron. Initially 7-strand No. 6 soft-drawn copper wire 18-in. long was used for the jumper. Fatigue failure near the terminal lug from vibration and conductor swinging prompted the use of 19-strand No. 6 soft-drawn copper. Jumper length was

(*Continued on page* 146)

TITANIC TUG-O'-WAR pits famous TV wrestling stars **Vern Gagne** (left) and **Yukon Eric** against sturdy General Electric capacitor to prove strength of superior G-E bushing construction.

GENERAL ELECTRIC



World's strongest capacitor bushings?

Dramatic test proves strength of unique G-E welded and soldered, cast-in-glass construction

G-E capacitor bushings are built to "take it." You needn't worry about rough handling pulling these bushings loose or breaking the hermetic seal.

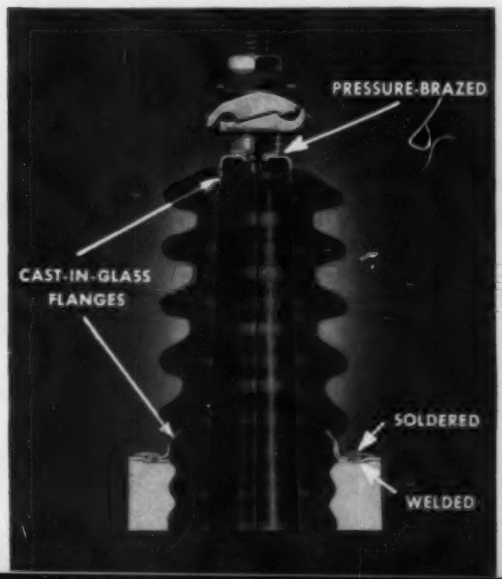
This extra strength means G-E capacitors will last longer in service, too. Here's why: All capacitors expand and contract with temperature variations, producing considerable stresses around the bushings. Unless bushings are very securely attached, these stresses are liable to cause loosening after several years of service. This would allow the impregnant to leak out, and moisture and air to enter the case, ultimately causing failure.

G-E bushings are made out of a specially compounded, low-expansion glass. Metal flanges with the same coefficient of expansion as the glass are integrally cast into the molten glass during manufacture. These flanges are then ***welded to the capacitor case for mechanical strength, and then hermetically sealed with solder.*** This unique General Electric manufacturing process produces a positive, air-tight, moisture-tight seal, so essential in the construction of a good capacitor. No other make of capacitor has welded and soldered cast-glass bushings.

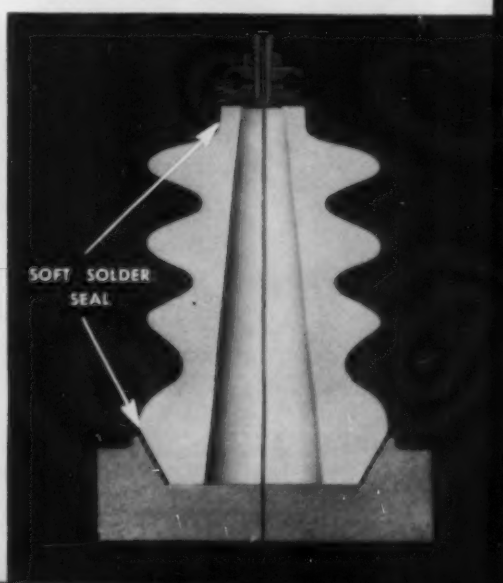
Extra strength bushings are just one of the many ***Engineered Extras*** in G-E capacitors that make them highest quality, and, your best value. You can always specify G-E capacitors with confidence. ***General Electric Co., Schenectady 5, N. Y.***

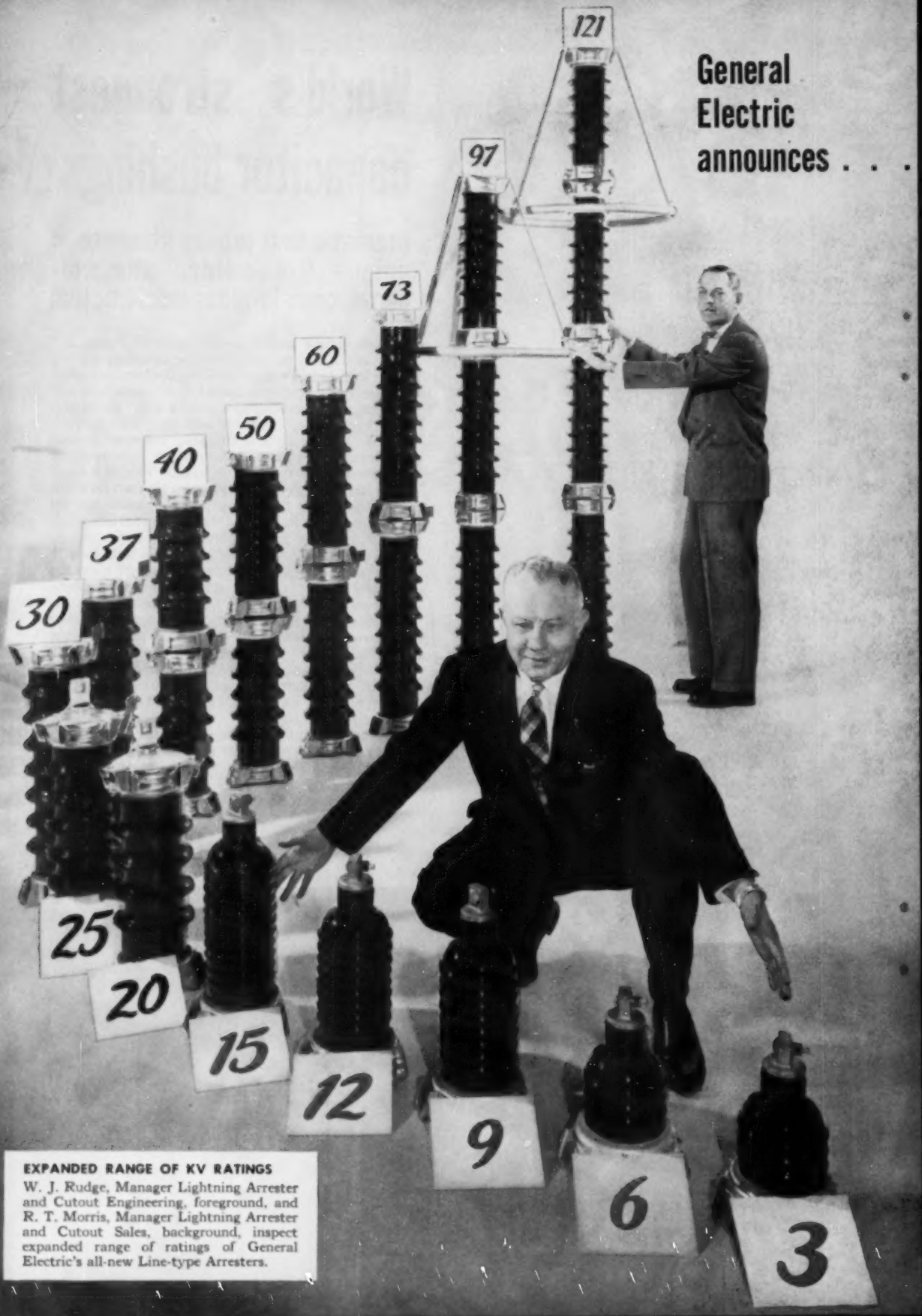
440-25

G-E CAPACITOR BUSHINGS are welded and soldered to the case for maximum strength.



OTHER CAPACITOR BUSHINGS are attached by only a soft solder seal.





EXPANDED RANGE OF KV RATINGS

W. J. Rudge, Manager Lightning Arrester and Cutout Engineering, foreground, and R. T. Morris, Manager Lightning Arrester and Cutout Sales, background, inspect expanded range of ratings of General Electric's all-new Line-type Arresters.

. . . . . ALL-NEW SERIES OF LINE-TYPE ARRESTERS

NEW! Expanded range—ratings 3 through 121-Kv

NEW! 20% better protective level

NEW! Magne-valve action in line-type arresters

Here is General Electric's new series of THYRITE* Magne-valve line-type arresters —revolutionary in design, exceptionally high in co-ordinated protective efficiency and in endurance. Seven new standard arrester ratings have been added to broaden the new line from 3 through 121-Kv.

Exclusive Magne-valve action is the key to the superior performance characteristics of this new arrester. This is accomplished by *magnetic* action of the series gaps aided by *valve* action of improved Thyrite valve disks. Already successfully applied to G.E.'s new THYRITE station-type arresters, and thoroughly proved since 1950 by thousands of service operations, Magne-valve action now applied to new line-type arresters means far higher reliability. For example:

BETTER PROTECTIVE LEVEL—Has 10% lower impulse sparkover voltage and 20% lower IR discharge voltage (see graph below)—representing a degree of protective efficiency *heretofore unobtainable in any line-type class of lightning arrester.*

LIBERAL DISCHARGE CAPACITY—Easily withstands the industry-standard long duration current test, as well as the industry-standard high current test of 65,000 amperes (5x10 ms wave).

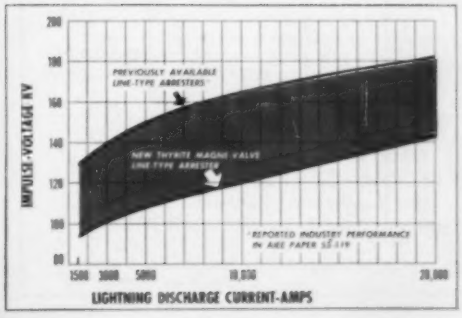
MORE STANDARD RATINGS FOR MORE APPLICATIONS—At numerous small or medium sized transformer substations, or switching substations, small sizes of metal enclosed switchgear (where limited space has heretofore been a problem), and at load centers.

G.E.'s new series of Thyrite Magne-valve line-type arresters is already a service-proven product available for your system. For full details, including performance data, check your nearest G-E Apparatus Sales Representative or write to General Electric Company, Schenectady 5, New York. Ask for Bulletin GEA-2978. 412-12

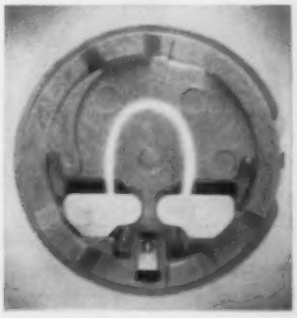
*Registered Trademark of General Electric Company.

Progress Is Our Most Important Product

GENERAL ELECTRIC



20% MORE PROTECTION compared to latest industry performance characteristics.

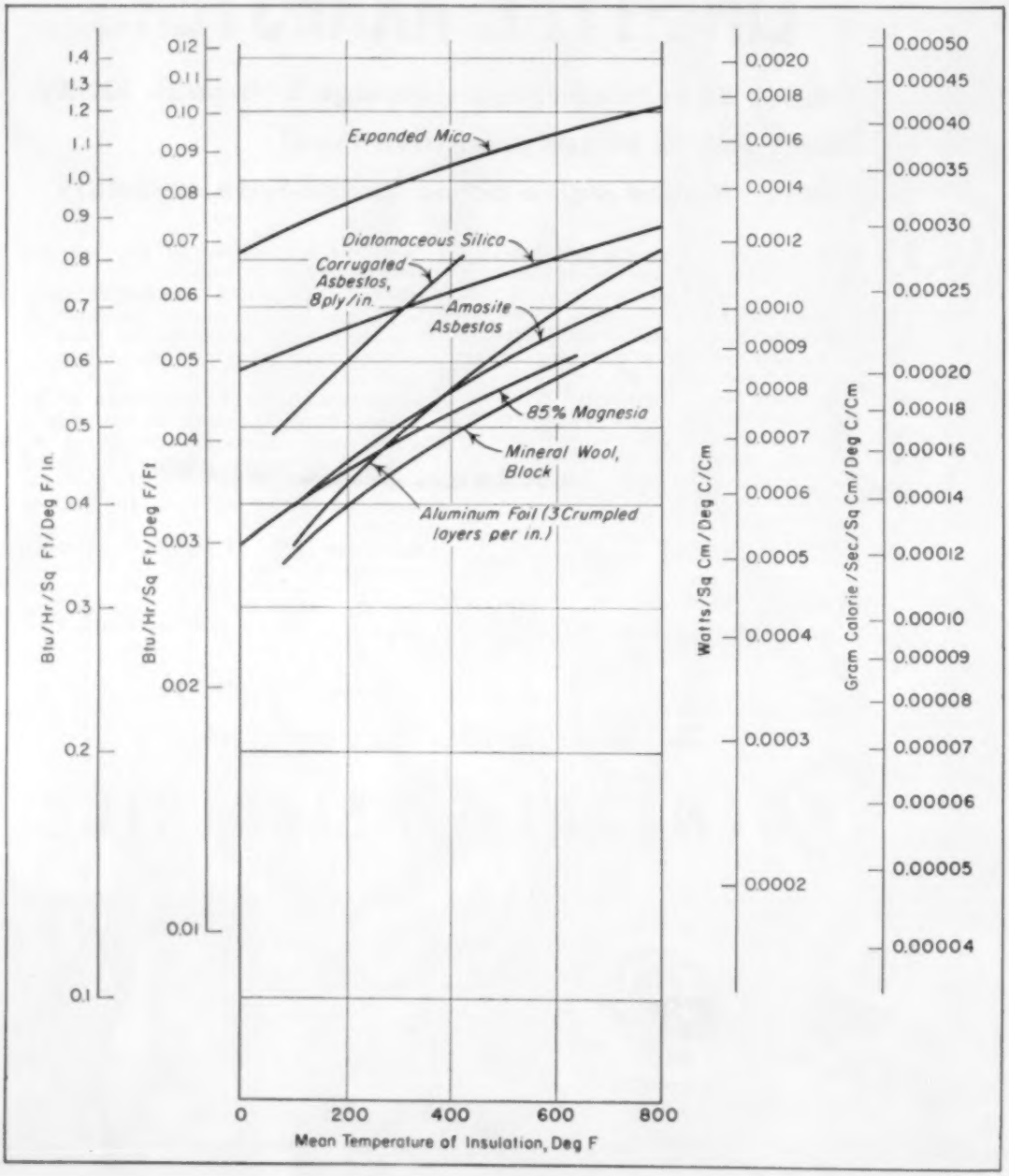


GAP UNIT with magnetic coil and pre-ionizing elements interrupts arc in less than half a cycle.

LOOSE GRAIN IMPULSE TESTING under pressure assures uniform quality of Thyrite disks.

Thermal Conductivity of Pipe Coverings

Chart gives thermal conductivity values for seven common pipe insulations in four units of measurement. Data were furnished by Battelle Memorial Institute



Reference: Piping Handbook, 4th ed, p. 701, by Sabin Crocker; McGraw-Hill Book Co, New York.
Similar data for refractory materials appeared as ERS No. 55—5 in Electrical World, Mar. 7, 1955.

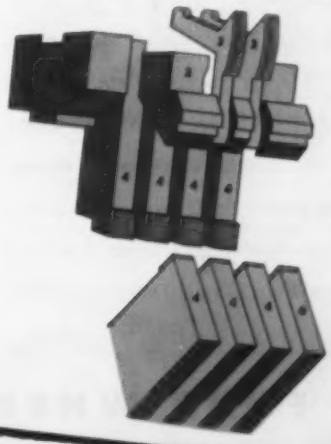
G-E Type AK-1-50 Electrically Operated Air Circuit Breaker, 1600-amperes, 600 Volts, A-C. One pole shown. Made by General Electric Company, Low Voltage Switchgear Department, 6901 Elmwood Ave., Philadelphia, Pa.

Here is the General Electric Type AK-1-50 Electrically Operated Air Circuit Breaker, 1600-ampere frame size used to protect low-voltage systems. The picture shows one pole of the contact, and in order to photograph it, the housing and the arc-quencher parts were removed. Note the Revere Extruded Shapes, and Rectangular Rod. There are three shapes, and one size of bar, all in copper, because copper has the highest electrical conductivity of all commercial metals.

If these shapes had to be "hogged" out of bar, they would be expensive, due to the machining time, and the scrap generated. While copper scrap is readily salable at good prices, it is costly from the machining standpoint. Extruded shapes by Revere, preformed to the desired contours, usually reduce machining to a cutting-off operation, plus such minor details as drilling which cannot be done during extrusion. Shapes naturally cost more per pound than bar or rod, but the ultimate saving makes up for the difference and more, sometimes several times.

Are you doing much machining of copper? If so, look into Revere Extruded Shapes. They may save money, and speed up production as well. See the nearest Revere Sales Office.

Sketch showing details of contacts. Nos. 1, 2 and 3 are extruded and drawn copper shapes. No. 4 is rectangular copper bar. Cross hatching represents special arcing contacts brazed to the copper.



REVERE

COPPER AND BRASS INCORPORATED

Founded by Paul Revere in 1801

230 Park Avenue, New York 17, N. Y.

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Mills: Baltimore, Md.; Chicago and Clinton, Ill.; Detroit, Mich.; Los Angeles and Riverside, Calif.; New Bedford, Mass.; Rome, N. Y. —Sales Offices in Principal Cities, Distributors Everywhere

Custom-

to give you

"More than just a Truck-"

The very concept and design of FWD—the *original* four wheel drive truck—correctly proportions power to weight on all wheels, puts the power where there's work to be done. There is no better answer to your heavy duty problems because FWD is the truck that starts where others stop. FWD gets jobs done where conventional trucks can't even travel. Bring your heavy duty problem to FWD for a custom-engineered answer. You'll be talking to a Four Wheel Drive specialist.

FWD

MATH ◦ MATIC DESIGN

More Driving Power

Less Dead Weight thru Lighter Alloys

Greater Load-Carrying Capacity

Gets to More Jobs . . . Gets More Jobs Done

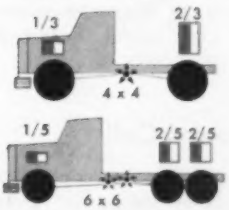
Greater Controllable Traction

Improved . . . and Proved Driving Safety

THE FOUR WHEEL DRIVE AUTO COMPANY

Engineered

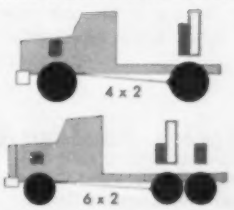
FWD WITH ADVANCED MATH-MATIC DESIGN



Note how power is correctly proportioned to weight distribution.

P Proportion of power on each axle

ORDINARY REAR-WHEEL-DRIVE TRUCKS



Note how power is wastefully concentrated on one axle.

Proportion of weight on each axle

Advanced Math-Matic Design—in every feature of FWD—correctly proportions power to weight on front and rear axles . . . making every pound of load help haul itself! Each wheel's load adds driving power, turning every ounce of torque into more controllable traction, greater steering safety. *WRITE OR CALL for (1) your free copy of illustrated product folders in weight categories from 14,500 to 60,000 lbs. GVW. (2) your copy of "The Truck That Went to College"—scientific proof of four wheel drive superiority.*

FWD MATH-MATIC DESIGN

BUILDERS OF AMERICA'S FOREMOST HEAVY-DUTY TRUCKS

CLINTONVILLE, WISCONSIN · *Canadian Factory,* **KITCHENER, ONTARIO**

Grounding Static Wires

(*Continued from page* 137)

increased to 24 in. and shaped as shown in the illustration, on page 137.

The shape is such that static wire swing causes twisting in the horizontal part of the loop and reduces bending in a plane normal to the jumper wire. Loop shape and the greater flexibility of the 19-strand wire is expected to eliminate jumper failures.

The positive ground connection has proved especially effective in reducing radio interference. This factor assumes greater importance where radio signal strengths are very weak.

A manufacturer cooperated in the design of the terminal lug which fits on the U-bolts of the suspension clamp.

Chemical Brush Spraying Cuts Costs, Improves Appearance

H. E. ANTLE, Manager, Boone County Rural Electric Membership Corp, Lebanon, Ind.

Three years of applying chemicals to control brush and trees along lines built on county and State highways has materially improved electric service. At the same time, clearing and trimming costs have been cut appreciably. Highways have greatly improved in appearance and will continue to improve as dead brush is cleared. Farmers are glad to be rid of the growth because it's much easier to care for fences. Grass is replacing underbrush along the highway.

In 1951 approximately ⅓ of the 760 miles of line was sprayed by a contractor during the late summer. Results were so encouraging that a trailer-mounted rig was purchased the following year so that our crews could do the work.

The rig has a capacity of 400 gal and can deliver up to 600 psi on two spray nozzles, each with a discharge capacity of eight gal per min. Spraying was done, however, at pressures of from 200 to 350 psi, depending on the thickness of the brush. Chemical applied consisted of two pounds of 2-4-D and one pound of 2-4-5-T, using about three quarts per 100 gal of solution.

In 1952, spraying was started late in May and the entire system was sprayed.

The third year, 1953, three types of chemicals were applied with each distributed over about ⅓ of the system. To one of the chemical solutions, five gal of fuel oil was added to each 100 gal of solution. Excellent results were noted on this application, although all three produced good results. Maps were maintained to show the solution applied to each part of the system and the year of application.

During 1952 the cost of applying the chemical solution, exclusive of the chemical, averaged 1.91¢ per gal.

EFFECTIVE SPRAYING was done with trailer having 400-gal capacity that delivers up to 600 psi to two nozzles. Spraying was usually at 200 to 350 psi depending brush density

Cost including chemical was $9.22 per mile in 1952 and $8.74 per mile in 1953.

Due to the exceedingly good results obtained, no further spraying is anticipated until 1956.

Fewer complaints came from farmers and land owners each successive year. Many farmers in the area now spray their fence rows, even under our lines, in an effort to control weeds and brush growth.

During the three years of spraying only two claims for damage were made. One was justifiable. It was caused by lack of precaution in spraying. The second claim was questionable since it was made more than 60 days after the application, and it was difficult to determine whether disease or spray caused the damage.

Device Speeds Handling of Emergency Calls

GEORGE YANDA, Superintendent, Customer Service Department, Cleveland Electric Illuminating Co, Cleveland, Ohio

The telephone switchboard capacity of the Cleveland Electric Illuming Co can be tripled by a device known as the "group-trunk" answering arrangement. This equipment increases the company's incoming call capacity from 1,800 to 5,400 an hour during widespread power difficulties.

By speeding the answering of incoming calls by 300%, the "group-trunk" answering system enabled the company's customers service and trouble departments to handle more than 20,000 calls between 8 AM and midnight during a freak blizzard last October.

During an emergency situation, the PBX switchboard operator merely switches up to 30 of the 43 incoming

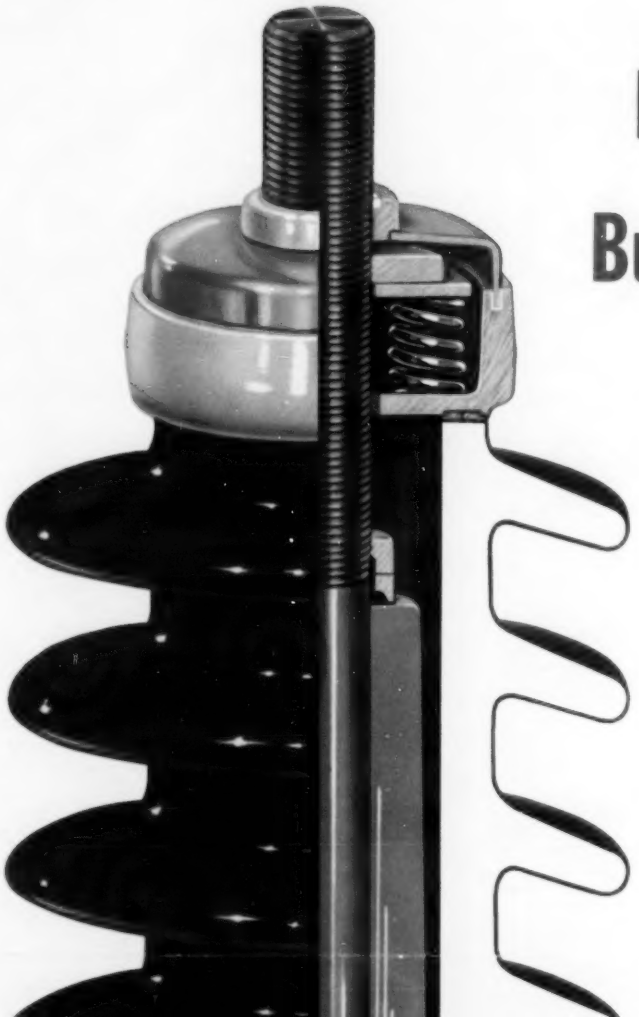
(*Continued on page* 155)

Your Invitation to See O-B's New ASA STANDARD *Bushing*

THIS is your invitation to see O-B's new ASA standard transformer and circuit breaker bushing in the voltage range of 23 to 69 kv . . . to study and appraise some of its advanced engineering features . . . to appreciate the background of experience, the research, the refinements, and the infinite care that this piece of equipment represents. On the following pages, read the story of this new bushing built on 40 years of previous successful experience.

Turn the page for the story

the heart of every *Ohio Brass* bushing



Now...Look at how new O-B Bushings are Made and Tested

● Techniques of making the new O-B bushing include a host of small but important details which space does not permit being shown. But there are several steps of manufacturing and testing that are both interesting and indicative of the care we exercise.

One significant fact cannot be shown by photography. Starting from the ground up, our bushing facilities are completely new, including a modern factory building and highly specialized new machinery, representing an investities that, for several years, have been devoted to this new product.

O-B's new bushing has the unusual advantage of being a product of a manufacturer with a 40-year background in the bushing business, and one of the leaders in this branch of the Electrical Industry. This experience and close association with the art of bushing manufacture enabled us to evaluate and select the best of American and European practices, many of which have been incorporated into our new design.

and highly specialized new machinery, representing an investment in excess of a million dollars devoted to bushings, alone. Naturally such cost does not embrace any of the research laboratory facil-

which have been incorporated into our new design.

Shown here, along with details of internal construction, are some of the principle steps in manufacturing, inspecting, and testing.

Winding the bushing core. At predetermined intervals, one wrap of thin aluminum foil is inserted to form a condenser plate. This foil is being fed onto the advancing paper web by the operator. In bushings of 69 kv and below, where the lower end of the core is exposed, the paper is coated with a thermal-setting resin and wrapped under heated rollers backed by many tons of mechanical pressure. This produces a dense, hard body of high mechanical strength and physical stability.

O-B Meets ASA Standards with a New Pencil-Slim Bushing

● User-groups of the Electrical Industry, through their various sectional and national organizations, have expressed insistence on a simplified, interchangeable standard for bushings. In the past, lack of standardization in transformers and circuit breakers, and the absence of any standard for station construction, were "joined together" by the bushing. This resulted in almost infinite variations.

Coincident with the development of a bushing standard, tank dimensions of station equipment have taken a radical trend toward smaller dimensions. This dictated reduced bushing diameters.

Presently, the new ASA standard reflects the thinking of both users and manufacturers of transformers, oil circuit breakers, and bushings. This standard has been approved and published in the voltage range from 23 to 69 kv. Progressively higher voltages are now actively in committee work and further standardization will undoubtedly be in effect in the near future.

We present here O-B's interpretation of the new ASA Standard in the form of a pencil-slim, paper-insulated, condenser bushing. In every respect this bushing meets or exceeds standard requirements.

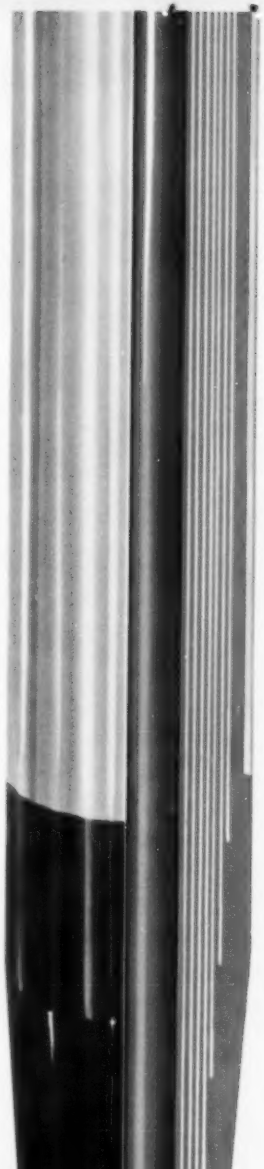
It should be borne in mind, however, that the standard relates purely to dimensional limits. It does not specify the electrical stability or service life of a bushing. This remains within the province of the individual manufacturer. A few details of *how well* the new O-B bushing is made are shown on succeeding pages.

Class LK 30
69 kv

Class LK 25
46 kv

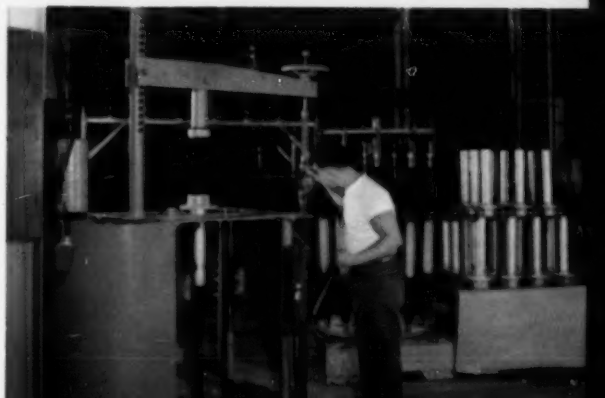
Class LK 20
34.5 kv

Class LK 15
23 kv



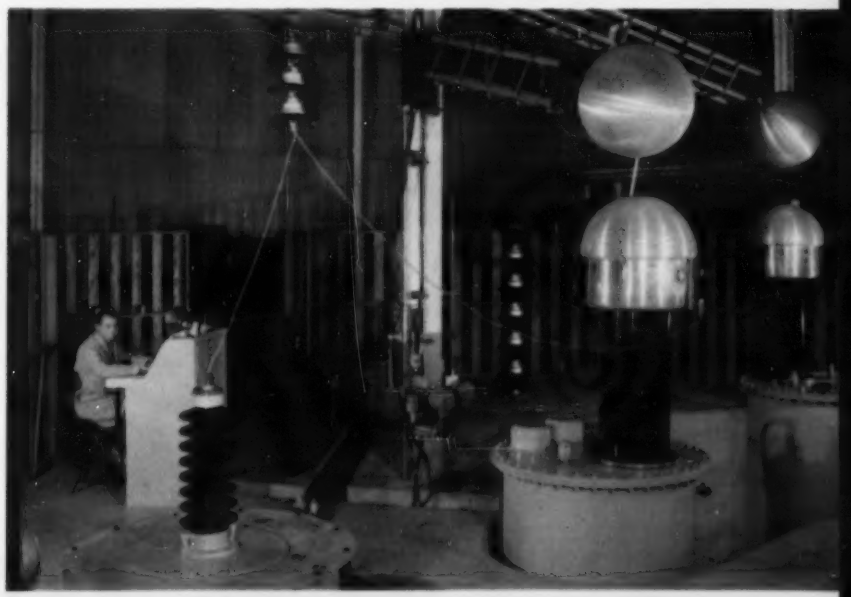
Cores from the winding machines go to heated ovens for final polymerizing of the resin coating on the paper, and are then moved to holding ovens in readiness for succeeding operations. At this stage, dryness is determined by a precision power factor test. After verifying dryness and checking to confirm power factor within required design limits, the cores are ready for further processing as illustrated at the right.

Cores are wound slightly over-size and are brought to final dimension and shape on lathes. All measurements are held to close tolerance. An aluminum ground sleeve is assembled to this core by means of a shrink fit. Such a joint is both mechanically strong and oil-tight. The small exposed band is the ground contact to the outer foil layer. A belt of light wire is wound over this foil for protection. This contacts the spring directly above the mounting flange, as shown in the cross-section view on the left of the page.



With core and ground sleeve assembled, a test is made for internal leakage in order to confirm the air- and oil-tightness of previous operations. This is done by an electronic "sniffer". The lower end of the bushing is exposed to Freon gas at high pressure and the sniffer checks possible leakage points in the core and flange zones. Because of the extreme sensitivity of this device, it will detect minute leaks in assembly of the various parts that would pass any other inspection process.

Porcelain casing, gaskets, and the oil reservoir complete final assembly. This jig loads the compression springs to the exact design value by means of hydraulic pressure. While under this final compression, all parts are assembled. After this point, the springs inside the oil reservoir maintain controlled mechanical gasket loading and follow-up for the life of the bushing.



General view of new 60-cycle testing apparatus installed specifically for routine bushing production inspection. The bushing in the foreground is being subjected to the standard holding test. Following this procedure, each bushing receives a final power factor check.

the heart of every *Ohio Brass* bushing

How We Assure Bushing Life With Airtight Spring Compression Assembly

Metal and porcelain elements of a bushing have a radical difference in their expansion and contraction response to heat and cold. If leakage is to be avoided, the seal must compensate for these differences.

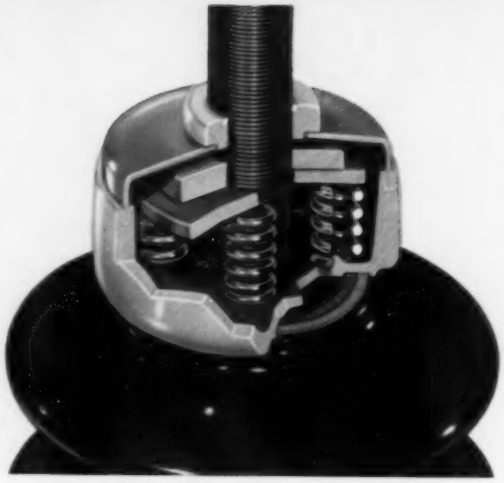
This fact was long-ago recognized in O-B bushing design. Over 20 years ago we developed the spring compression assembly. In a single step, this efficient sealing method and the resilient assembly to maintain this seal, altered the entire picture of bushing performance. It provided permanent protection to the inherent electrical stability of the insulation.

Greatest value of this assembly method relates to gasket performance. Gaskets are at their best under an optimum physical loading. Mere bolt pressure will neither establish this condition originally nor maintain it indefinitely, whereas spring pressure can apply both measured loading and adequate follow-up. By a simple adjustment of load at the time of assembly, gasket joints maintain a permanent state of maximum efficiency.

An ingenious improvement has been incorporated in the assembly of the new bushing. For years, cork gaskets have been widely used. The relatively high surface adhesion of cork prevented lateral displacement of parts during handling in shipping and storage. Synthetics, on the other hand, have great density and sealing power but have a tendency to "flow" under load. In the new O-B bushing, the best qualities of each are combined by using a double gasket consisting of concentric rings of the two materials, as shown in the illustrations. To restrict any tendency of the gasket materials to flow, the metal face is recessed to form a trap. We have thus capitalized on the best features of each material, and added to it the long-established reliability of spring compression assembly.

This is just one more instance of how more than 40 years of previous successful experience stand behind O-B's new ASA Standard bushing.

OHIO BRASS COMPANY, MANSFIELD, OHIO, U.S.A.
In Canada: Canadian Ohio Brass Co., Ltd., Niagara Falls, Ont.



Detail of O-B spring compression assembly method. Springs are originally compressed by hydraulic control at the time of assembly. Under this measured loading, they are then held for the life of the bushing by the retaining nut which engages threads on the conductor. The conductor is free to move within the reservoir, and spring force presses this reservoir against the upper end of the porcelain housing. In turn, this force is transmitted by the housing to the contact faces at the flange. In this way gaskets are worked at their most efficient compression with adequate follow-up force. Slight movements of expansion and contraction of parts which are compensated for by the compression springs, must naturally be absorbed in some flexible part when we have a totally sealed unit. The upper portion of the oil reservoir, shown in brilliant red, is a phosphor-bronze diaphragm which provides necessary movement.

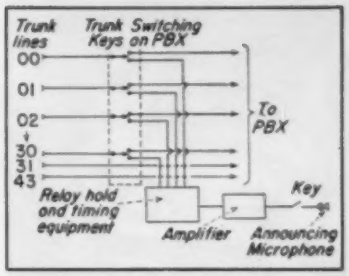
Examples of concentric gaskets used in the new bushing. The inner ring is a synthetic material having unusually high density and sealing power. The outer ring is cork which imparts mechanical strength and resiliency to the joint. In this way, two specialized materials are combined for highest over-all efficiency.

Gasket joint at the flange. The metal face has been recessed to trap material in the two concentric gaskets.

the heart of every Ohio Brass bushing

Answering Device

(*Continued from page* 146)



BLOCK DIAGRAM shows "group-trunk" answering system for use in power emergency

trunk lines onto a one-way talk telephone. A specially prepared message is then delivered simultaneously to the callers, giving them a capsule report of the power difficulty. At the end of the message, all calls on the device are automatically disconnected and a new group takes their place.

When a customer has a particularly dangerous condition to report, or when his call does not pertain to the trouble, he is given a special number which is answered by the regular switchboard operator. This system has been designed for a sudden overload of calls on the PBX, when not enough operators are immediately available to handle them. As calls slacken or operators increase, lines are switched back to the switchboard to be answered personally.

Through this device, callers get a quick and complete report of an emergency situation and more customers are able to reach the company.

Test Rack Checks Joint Performance

CHARLES L. KELLER, Superintendent, Underground Department, Toledo Edison Co, Toledo, Ohio

A conveniently located test rack has been installed at Toledo Edison Co's service center to determine whether compound will leak through the tape. Joints are made up and kept under moderate pressure, up to 30 lb, at all times. They are observed regularly to determine whether there has been oil migration.

Several joints and tapes, of the 120/208-v type, are under test on the rack now. They are made up with:

(*Continued on page* 156)

WATCH YOURSELF!
(Everyone else does)
USE DIAMOND
UtiliVue
INDUSTRIAL TELEVISION SYSTEM
Everyone can see those tall chimneys that carry off gases or fumes from your plant. Many of these people will judge unfairly . . . will blame you for everything from smog to tattle-tale grey wash . . . even though there is smoke for only a few minutes a day.
The "UtiliVue" (wired television) will bring a sharp picture of the stacks to the control panel or any other convenient point. The operator SEES the smoke exactly as do people on the outside and takes corrective action at once. Chimney smoke is only one of many things that the "UtiliVue" can watch to your profit and advantage . . . in fact, anything that is too remote, too hot, or too dangerous to observe directly. Get in touch with your Graybar Distributor or use the coupon below for informative booklet.
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Since 1903, Diamond has Manufactured Quality Equipment for Industry
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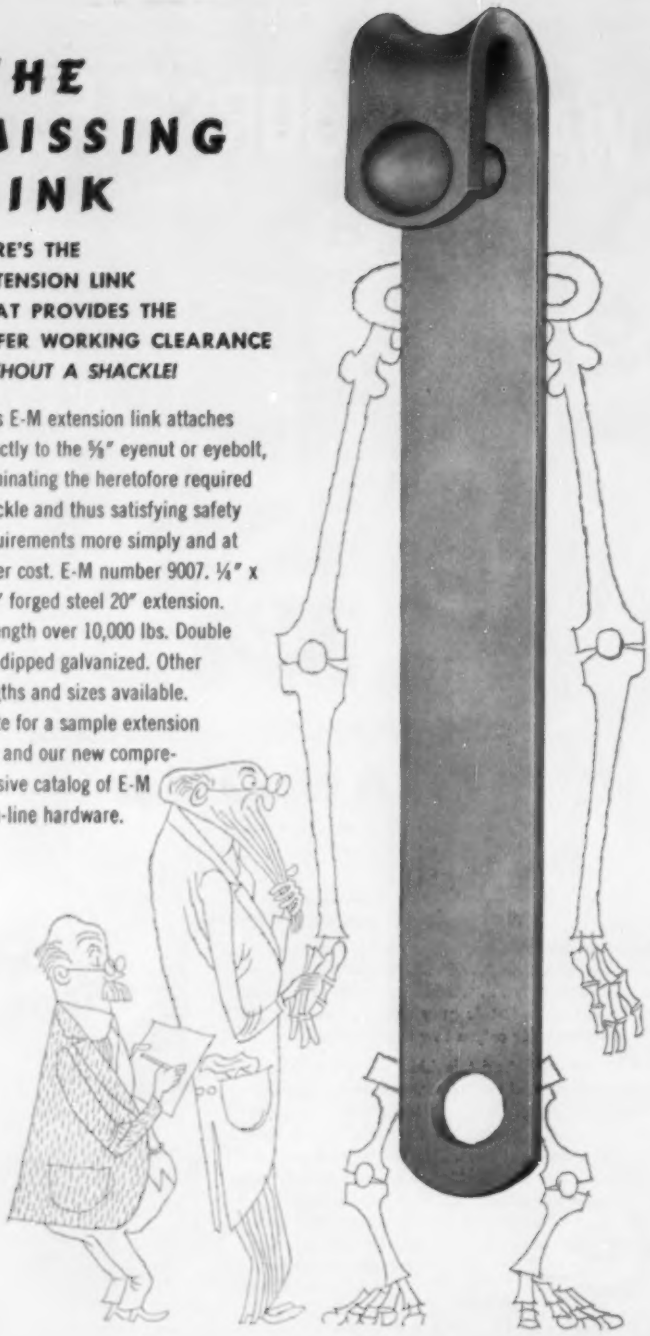
ELECTRONICS DEPT., P.O. BOX 415 W,
LANCASTER, OHIO
Please send me without obligation a copy of new bulletin showing how Diamond Industrial (Wired) Television will help me reduce costs, improve quality, increase sales and aid safety.
Name
Title
Company
Address

THE MISSING LINK

HERE'S THE EXTENSION LINK THAT PROVIDES THE SAFER WORKING CLEARANCE *WITHOUT A SHACKLE!*

This E-M extension link attaches directly to the ⅝" eyenut or eyebolt, eliminating the heretofore required shackle and thus satisfying safety requirements more simply and at lower cost. E-M number 9007. ¼" x 1½" forged steel 20" extension. Strength over 10,000 lbs. Double hot-dipped galvanized. Other lengths and sizes available. Write for a sample extension link and our new comprehensive catalog of E-M pole-line hardware.

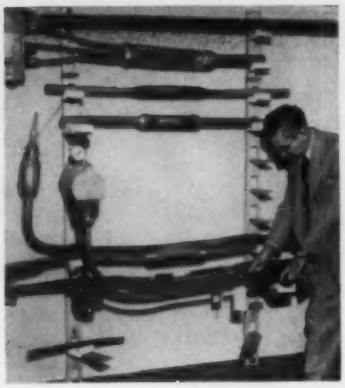


ELECTRICAL MANUFACTURING CO.
BATTLE CREEK, MICHIGAN

Designers and manufacturers of pole-line hardware that saves you time, money and maintenance. Prompt action on special problems.

Joint Test Rack

(*Continued from page* 155)



TEST RACK checks effectiveness of various types of joints, tapes, and compound to determine whether compound will leak through tape

1. Two layers of plastic electrical tape, adhesive side down, which is then given a coat of rubber cement. Self vulcanizing rubber tape is then applied to a proper dimension and finished off with two layers of plastic electrical tape.

2. Three layers of varnished cambric tape sealed with adhesive between layers. Self vulcanizing rubber tape is then applied to proper dimension, and finished off with two layers of plastic electrical tape.

3. Two layers of plastic electrical tape, adhesive side up. Self vulcanizing rubber tape is then applied to proper dimension and finished off with two layers of neoprene tape.

It is planned that the joint type and tapes that perform best on the test rack will be tried out in service.

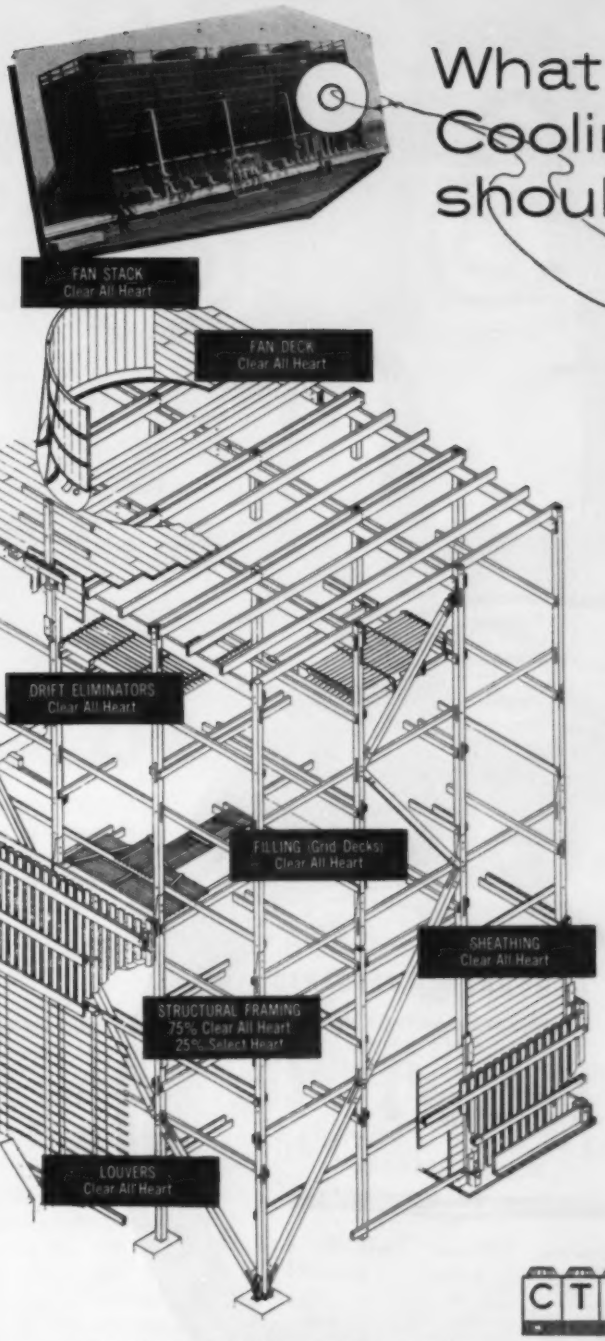
Raking Hot Line Speeds New Line Construction

Installation of a new 55-kv line on the same right-of-way with an energized 15-kv circuit was speeded by raking the hot line to one side. This time-saving method was used by Puget Sound Power & Light Co in building a 12-mile section of line on Whidbey Island in western Washington.

Changeover was started by digging a hole down the side of each 15-kv pole with a mechanical digger. Then the poles were piked to a sharp angle, and holes backfilled and tamped. With the poles raked out of the right-of-

(*Continued on page* 160)

What every Cooling Tower buyer should know



■ A cooling tower is an important piece of industrial equipment. It can be a constant source of trouble, or a sound, profitable investment. Look at the specifications when buying a cooling tower, not at the price tag. The quality of materials from which a tower is fabricated, the structural design, the performance of mechanical equipment, its life expectancy, the experience and integrity of the manufacturer—these are the real values of a cooling tower. Be sure that the tower *size* and the *quality* of the materials meet your carefully prepared specifications.

The cost of a cooling tower is divided approximately 70% for the tower itself and 30% for mechanical equipment. Big price differences lie in the quality and sizes of lumber used in their construction. Fluor towers are prefabricated from California redwood. "Yard Grades" of California redwood are selected in this order: (1) Clear All Heart, (2) A Grade, (3) Select Heart, (4) Utility, (5) Construction Heart, (6) Sap Common, (7) No. 3 Common. Fluor uses only Clear All Heart and Select Heart in their cooling towers. A Grade contains sapwood and Fluor does not use lumber containing sapwood. The only Select Heart in a Fluor tower is about 25% in structural lumber. All the rest is Clear All Heart—the best there is.

Hundreds of thousands of board feet go into a cooling tower and prices will vary as much as $17 per thousand board feet between one grade and the next. You can readily see how substituting a lesser grade will substantially lower the price of a tower, and lower its operating life. When you buy on price, you do *not* get what you pay for.

CTI

Fluor has been building cooling towers for 34 years and has repaired many hundreds of them —all makes and models. We know from long experience what should go into a cooling tower and what should not. Fluor towers are universally recognized as the finest you can buy. We cannot compromise with quality or offer an inferior tower to satisfy a price. We urge you to be guided by your carefully prepared specifications and not let the cost of a tower be the sole influence.

BE SURE WITH

FLUOR

THE FLUOR CORPORATION, LTD
LOS ANGELES 22, CALIFORNIA
FLUOR OF CANADA - TORONTO
FLUOR PERUANA, S.A. - LIMA
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ENGINEERS
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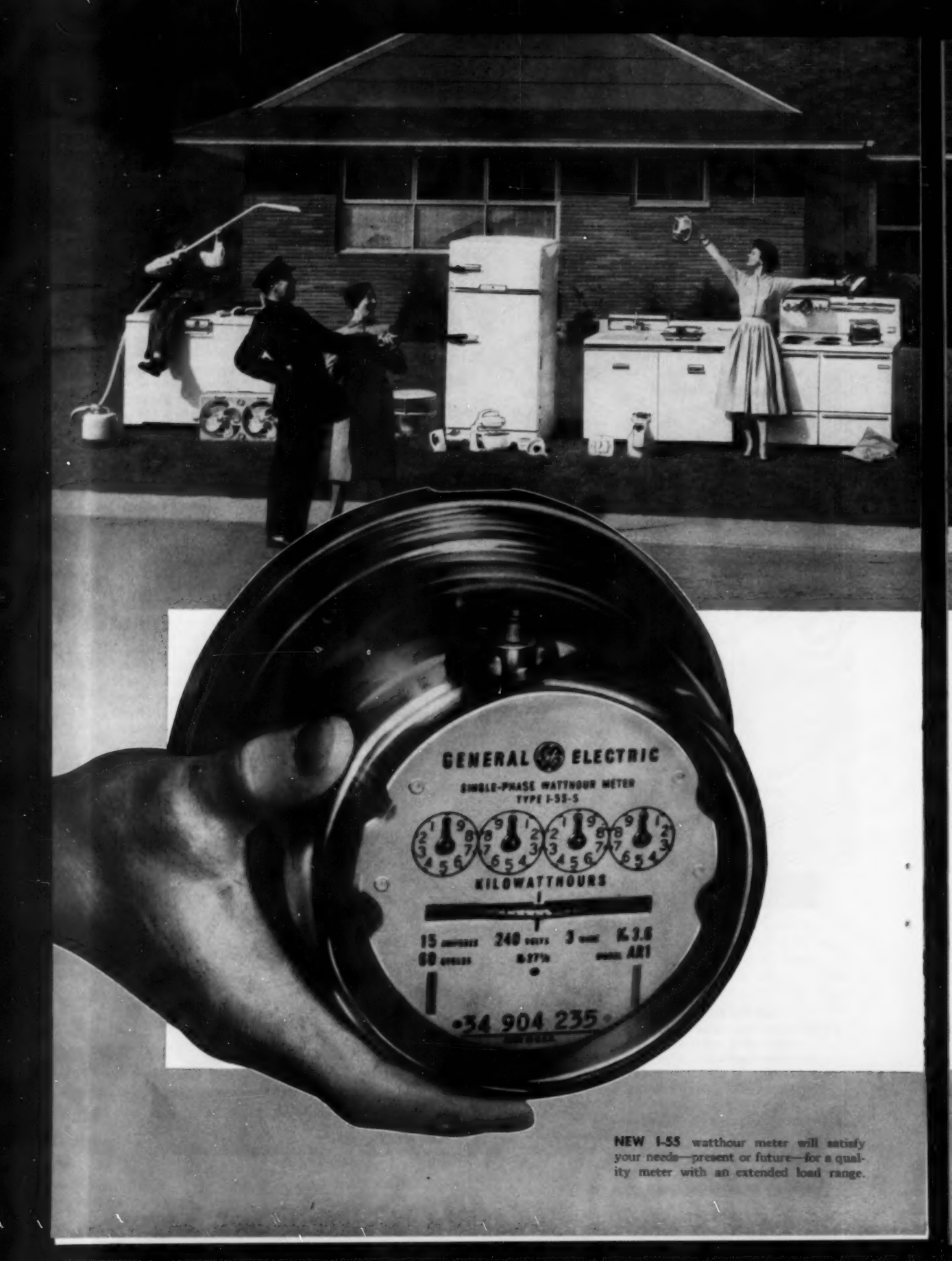


NEW I-55 watthour meter will satisfy your needs—present or future—for a quality meter with an extended load range.

THESE 30 APPLIANCES SYMBOLIZE THE CAUSE FOR INCREASING RESIDENTIAL LOADS, WHICH WILL DOUBLE IN THE NEXT TEN YEARS

NEW General Electric I-55 Watthour Meter Designed to Measure Increasing Loads

NEW METER FEATURES STRAIGHT LINE ACCURACY UP TO 100 AMPS

Combining all of the proven qualities of the I-50 meter family with straight-line accuracy up to 100 amps, General Electric's new I-55 watthour meter will meet your requirements for a quality meter.

INCREASING RESIDENTIAL LOADS, predicted to double within the next ten years, necessitate a new meter like the I-55, capable of measuring loads up to 100 amps. This newest addition to General Electric's I-50 meter family has been designed to measure the increasing loads of the home of today or of the all-electric home of the future.

ALL COST-SAVING FEATURES of the proven I-50 meter family have been incorporated into this new extended-range meter. Magnetic suspension, unique retarding system, rigid unit construction, and easier-to-read pointer and cyclometer registers are but a few of the original I-50 qualities which are present in the new General Electric I-55 meter.

FOR MORE INFORMATION on the new I-55 meter, write for bulletin GEA-6071 to: Section 621-2, General Electric Company, Schenectady 5, N. Y.

Progress Is Our Most Important Product

GENERAL ELECTRIC

→ A Completely NEW LINE of Service Bodies with

25 FEATURES

that give a new meaning to "UTILITY"

1. Models to fit 40 different Chevrolet, Ford, International, GMC, Dodge and Studebaker chassis . . . single or dual wheel.
2. For ½ - ¾ - 1 - and 1½-ton trucks.
3. 18 different compartment arrangements.
4. Exclusive 4-point coil spring body mounting.
5. Complete line of Service Accessories.
6. Bonderized, all-steel welded construction.
7. Double lap-type joints.
8. Extra-wide doors for easy access.
9. Larger, greater capacity compartments.
10. Embossed door panels for rigidity and appearance.
11. Fully recessed door handles.
12. All doors keyed alike.
13. Tumbler-type locks at no extra cost.
14. Full bolt-action locking bar.
15. Weatherproof compartments . . . lap-seal and gutter drain on all doors.
16. Raised bottoms of all vertical compartments provide extra protection for tools and supplies.
17. Heavy-duty reinforced 16-gage bulkheads.
18. Outside compartment headers 14-gage steel.
19. 4-way, 12-gage, safety tread non-skid floor.
20. From 25 to 35 sq. feet of floor loading area.
21. Through wheel housings for universal dual wheel application.
22. Reinforced tailgate.
23. Extra strength, bridge-type construction with interlocking lateral and longitudinal reinforcements.
24. Side boxes supported by one-piece cross members, reinforced at mounting holes.
25. Beaded fender panels hinged for easy access to wheels and spring shackles.

For Better Service and Greater Utility . . . Specify

Morrison service bodies

→ WRITE FOR DETAILS: Morrison Service Body Division
MORRISON STEEL PRODUCTS, INC.
695 Amherst Street Buffalo 7, New York

• Also manufacturers of MOR-SUN Furnaces and ROLY-DOOR Steel Garage Doors

Raking Hot Line

(*Continued from page* 156)

way, three line crews did a coordinated job of digging holes, setting, poles, framing pole tops, and stringing wire. After the new line was energized, the old line was taken down.

Ingersoll-Rand Photo

Electric Wrenches Reduce Erecting Time

Considerable time was saved in erecting 532 steel towers for Metropolitan Edison Co's new 230-kv line through the use of electric impact wrenches by Sordoni Construction Co.

Each of the medium and heavy towers has from 2,000 to 4,000 bolts in sizes of ⅝ and ¾ in. The tightning job was done by six men working simultaneously at a tower. Four men set the nuts and two others tightened them with the electric wrenches, which were supplied from portable generators.

GIVE YOUR INSULATING OIL THE FULL TREATMENT....

FOR SAFETY....

FOR ECONOMY....

DE LAVAL
insulating oil purifiers

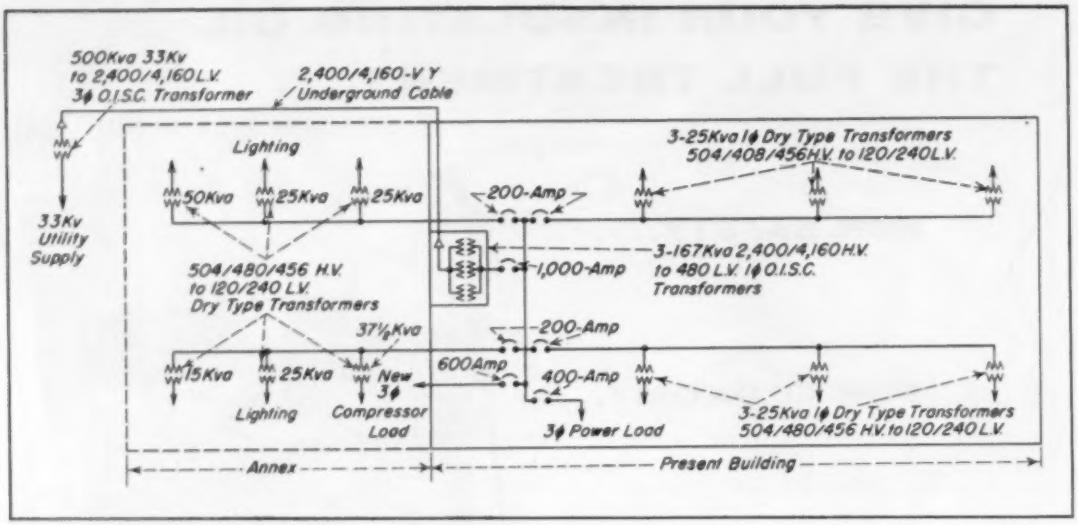
The full treatment is wrapped up in a single machine — the De Laval Insulating Oil Purifier.

The De Laval Insulating Oil Purifier *drys* the oil completely . . . It's guaranteed to reduce the free moisture content to 1/1000 of 1%. It *cleans* oil thoroughly.

It dehydrates with a *single* pass . . . at safe *low* temperature . . . operates with minimum attention and without shutdowns during the run for cleaning or renewing of parts.

Give your transformer and circuit breaker oil the complete De Laval treatment . . . with a *guaranteed performance* De Laval Insulating Oil Purifier.

THE DE LAVAL SEPARATOR COMPANY Poughkeepsie, New York • 427 Randolph St., Chicago 6 • **DE LAVAL PACIFIC CO.** 61 Beale St., San Francisco 5



New load centers dictated placement of transformers . . .

Distribution Modified to Serve Annex

L. J. LANGEVIN,
Power Engineer, Cincinnati
Gas & Electric Co, Cincinnati, Ohio

A frozen-food annex has been added to Kroger Co's warehouse in Woodlawn, Ohio. New compressors and lighting were added, requiring the extension and some rearrangement of the present distribution system.

Electric service was supplied by a 4,160-v, 3-phase overhead line to the terminal pole at the northwest corner of the building. From the terminal pole, the 4,160-v cables run underground in connected fiber ducts to an inside fireproof transformer vault which houses a 200-kva O.I.S.C., 4,160/480-v, 3-phase, 60-cps transformer.

All main power and light distribution circuits are 480-v, 3-phase. Two 200-amp, 480-v, 3-phase, 3-pole circuit breakers or switches supply two lighting feeders. Six 25-kva 504/480/456 H.V. to 120/240 L.V., single-phase dry-type transformers are used to step down to the lighting utilization voltage from these feeders. Three of these transformers are connected on each feeder to give a balanced 3-phase load. Feeders are arranged so they may be extended at either end to permit further expansion. Two 200-amp, 480-v, 3-phase, 3-pole circuit breakers supply power feeders.

The new addition increased the plant's power demand by 100-kw of lighting and 300 hp of motor load. The total plant load will run 200 kw for lighting and 400 hp motor load.

This load was too large for the existing 4,160-v feeder. Accordingly, a transformer station was constructed beside the present terminal pole. A bank of three 150-kva, 33,000/4,160-v, single-phase, 60-cps, O.I.S.C. transformers were installed in the transformer station. Connections were made to the existing 4,160-v underground cable, which terminates in the transformer vault in the building. Metering is at 4,160 v.

In the transformer vault, the existing 200-kva, 3-phase transformer was replaced with three 167-kva, 4,160 Y/2400 H.V. to 480 L.V., single-phase 60-cps O.I.S.C. transformers.

The existing lighting feeders were extended to the new load area. New power feeders were installed to serve the compressor motors. The transformer vault is situated so that it will be close to the actual load center.

Selection of 480-v, 3-phase lighting feeders offers these advantages:

1. The length of the lighting feeders will be greater than 500 feet. This would produce an excessive voltage drop with 120/240-v, single-phase feeders, and cause a low-voltage condition. With 480-v, 3-phase feeders, the voltage drop is reduced to an allowable value.

2. Considerable copper savings.

3. The 25-kva, 504/480/456 H.V. to 120/240 L.V. single phase, dry-type lighting transformers were placed at the centers of the lighting load area served by each. Taps were provided above and below 480 v so that the correct utilization voltage may be set for each transformer.

4. Separate 480-v, 3-phase power and lighting circuits were provided to eliminate light flicker caused by starting of compressor motors.

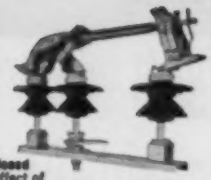
5. The lighting feeders were sized to permit future extension and addition of 100% increased lighting load, should the warehouse be extended.

6. Placing the transformer vault at the center of the west wall of the existing building was calculated to spot it at the load center.

7. The selection of 480-v distribution for both power and lighting feeders obviates two separate transformer banks in the transformer vault.

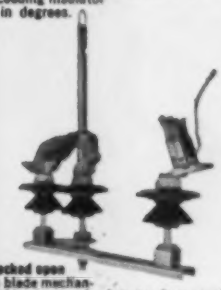
(*More Industrials on page* 166)

The blade of the MK-40 switch is actuated by a 45-degree bearing mechanism which replaces cranks, levers, links and cams. It converts motion of operating insulator to a vertical lifting and rotating motion of the blade, with smooth sequence and complete control at all times.



Switch closed
Toggle effect of mechanism locks the blade in position. First 15° rotation of the insulator rotates the blade about its own axis, creating enormous leverage force.

Switch partly open
Ingenious engineering principle effects blade rotation, with the blade rise in degrees exceeding insulator rotation in degrees.



Switch locked open
with the blade mechanism knuckle pin over dead center. Leverage force again breaks ice accumulation or corrosion easily.

simplified, powerful blade mechanism

for smoother operation, longer service with MK-40 Air Switches

Only DELTA-STAR MK-40 Switches offer all these additional advantages

- Visible high pressure silver inlayed hard drawn copper contacts at both ends of switch blade. Independent pressure applying non-ferrous leaf springs assure constant pressure. Heavily constructed with a minimum number of current interchange surfaces to withstand high short circuit currents.
- These switches have the same simple basic design in all rated sizes: 7.5 kv to 380 kv, 400 to 5000 amperes.
- Greaseless non-rusting rotating insulator bearings.
- Fully adjustable operating mechanism parts with pipe piercing set screws to eliminate slippage.

This close look at the MK-40 blade mechanism demonstrates another reason why this DELTA-STAR Air Switch is your standard of comparison.

The MK-40 is the result of a search for engineering simplicity and maximum efficiency. Only three moving parts are employed. No cranks, levers, links or cams are used. Factory sealed mechanism contributes to easiest possible maintenance and long life.

The blade mechanism develops enormous leverage in initial opening and final closing. Ice accumulation or corrosion at either end is easily broken. Variation in leverage equalizes the gravitational pull on the blade and results in smooth uniform operational effort.

This powerful, simplified blade mechanism is fundamental with all MK-40 Air Switches—from 400 to 5000 amperes and from 7.5 to 380 kv. It is another reason for preferring DELTA-STAR MK-40 Switches.

When you want the best in high voltage switches specify the MK-40

DELTA-STAR ELECTRIC DIVISION

H. K. PORTER COMPANY, INC.
OF PITTSBURGH
2437 Fulton Street • Chicago 12, Illinois
District Offices in Principal Cities

DESIGNED FOR OUTDOOR as well as indoor use, the CF-7 recorder withstands extreme heat (100 C) and cold (−40 C). A rubber gasket around the hinged cover completely seals the recorder case—helping to prevent rainwater and dirt from damaging the instrument or impeding its performance. The CF-7 will operate at 1 inch per hour for as long as thirty days, without attendance.

Accurate G-E Hook-on Recorder Can Help Analyze Coming Electrical Load Problems

G-E Instrument measures without interrupting service, gives clear, convenient records with a minimum of maintenance

General Electric's CF-7 portable hook-on recorder is a convenient, multi-range means of recording varying loads up to 750 amps—without interrupting service or wasting production time. You can use this versatile instrument to help solve coming load problems with such typical applications as:

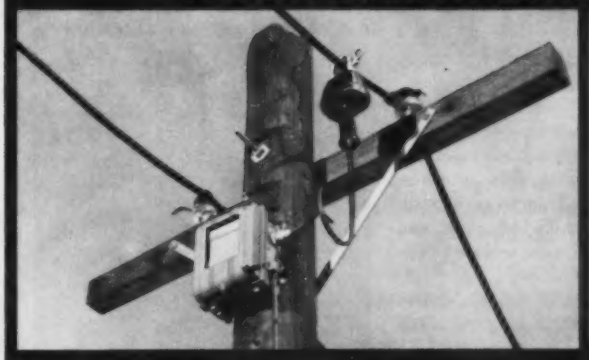
- Determining the sub-division of loads in distribution networks.
- Checking air-conditioning circuit operations.
- Checking loads on boiler feed pumps, electric heating installations and powerhouse machinery.
- Analyzing the characteristics of growing industrial and commercial loads.
- Checking for under- or over-loading of transformers.

INSTALLATION of the CF-7 recorder requires little more time than it takes for any hook-on instrument. Simply mount recorder, connect to 120 V or 240 V power supply, select range, attach leads, and hook on the line.

FOR FURTHER INFORMATION contact your nearest Apparatus Sales Office or clip and send the coupon.

G-E HOOK-ON volt-ammeter gives you accurate records over a wide range. Seven ranges provide a maximum number of applications at a minimum of instrument investment (15/75/150/750 amperes; 150/300/750 volts). An external range switch simplifies range changing.

G-E RECORDER CARRIES ASA INSULATION RATING OF 8700 VOLTS



SECTION A582-3
GENERAL ELECTRIC COMPANY
SCHENECTADY 5, NEW YORK

Please send me a copy of the bulletin(s) checked below:
☐ GEA-5469 Buyer's Guide for Testing Instruments
☐ GEA-6104 CF-7 Hook-on Recorder

Name .....

Company .....

Street .....

City ..... Zone ..... State .....

SAFE AND ACCURATE: Butyl molding makes possible a transformer insulation rating of 8.7 kv. Even high-voltage circuits may be tested. Calibrated accuracy is ±3% of full scale (4% above 625 amperes). Installation is quick and simple.

FOR DETAILS on how G-E hook-on instruments can save you time by simplifying measurement, contact your Apparatus Sales Representative or clip and mail coupon for free bulletins.

GENERAL ELECTRIC

Pat. Pend.

*KLEIN KUT PLIERS

for both regular and heavy-duty cutting

It was Klein that produced the first and still the finest regular side-cutting plier. Klein also gave the industry the modern, streamlined version so much in demand.

And it's Klein again with a new, high leverage cutting plier for light- or heavy-gauge wire, including No. 2 weatherproof hard drawn solid copper wire, and A.C.S.R.

There's no extra hinging of any kind—no uncomfortable wide-spread handles—with this new Klein-Kut Plier. The offset hinge permits the extra-high leverage and operation is as smooth and easy as with any other Klein Plier. Forged from high-grade tool steel, individually fitted, tempered, adjusted and tested. Ask for No. 213-9 N.E. for streamlined pattern.

Regular pattern available
Same high-leverage design, but in the original Klein side-cutting pattern. Ask for No. 213-9.

Write for free Copy of Bulletin 1054

*Trade Mark

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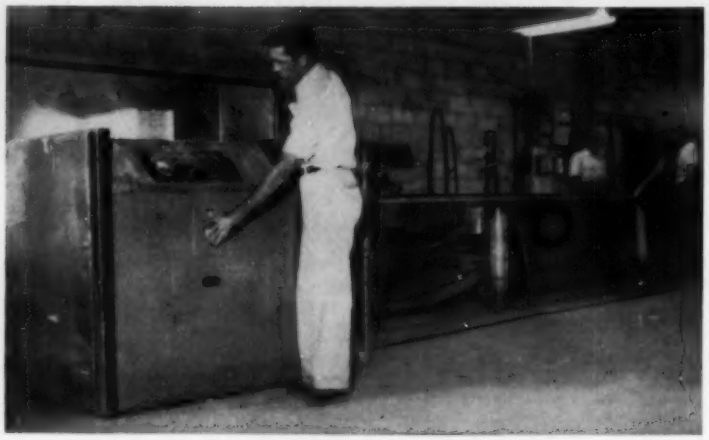
Induction Heating

- Speeds output while cutting rejects
- Costs little in comparison to its value



H-F Heating Triples Production at ½ Cost

Drying glue on cores of plywood-covered doors with 10-kw high frequency core drier at Bradley Plywood Co, Savannah, Ga., triples production at one-half the cost. The savings of $26,000 per year paid for this installation in three months and resulted in fewer rejects, less glue, less planning and less valuable floor space. The h-f drier replaced the formerly-used air drying method. The plant makes plyboard and flush panel doors, the cores of which are made of scrap material glued together, C. D. Anderson, Power Sales Engineer, Savannah Electric & Power Co, Savannah, Ga.

Induction Unit Heats Griddle Blanks

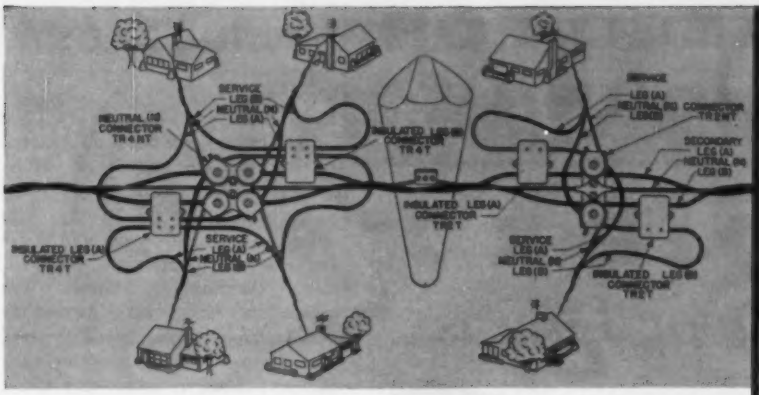
E. D. ANDERSON, Elmer D. Anderson Co, Sixty-Cycle Design, Dearborn, Mich.

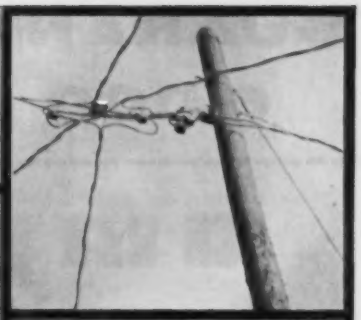
Magnesium blanks to be formed into griddles are now electrically heated at Brooks & Perkins, Inc, Detroit, by a 60-cps induction unit. The device occupies about 14 sq ft of floor space, has a low initial cost, and requires no warm-up time. Furthermore, blanks are heated as needed, eliminating hot blanks in storage, and the operator has cooler working conditions.

The induction unit heats a 2.1-lb griddle blank to 600F in 8 sec. The blank is then formed in a die kept at 550F with resistance heaters installed in the base plates of the die.

Inductor coils of the 70-kva unit were designed for a 208-v supply. Heating time was determined by flicker limitations at the location. Four seconds would be feasible in a more favorable spot. Over-all electrical efficiency of the unit is 80%.

OPERATOR inserts griddle blank into induction field. Blank will reach 600F in 8 sec, ready for quick resistance-heated die forming





A complete 4 Service Connection made 18" from pole with a 2 Service Connection made close to pole. †

no taping . . . faster, easier connects and disconnects

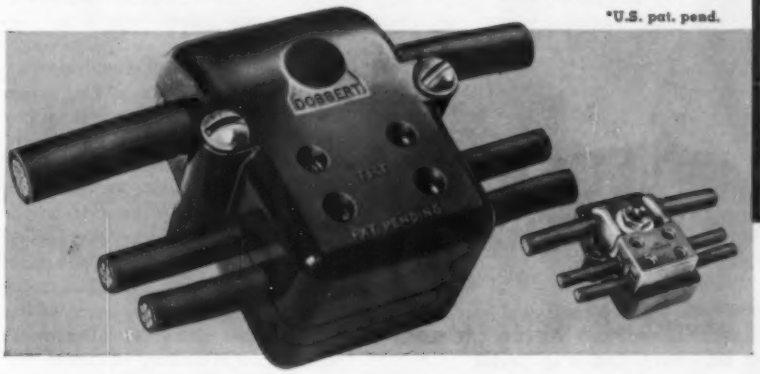
with the NEW *DOSSERT*

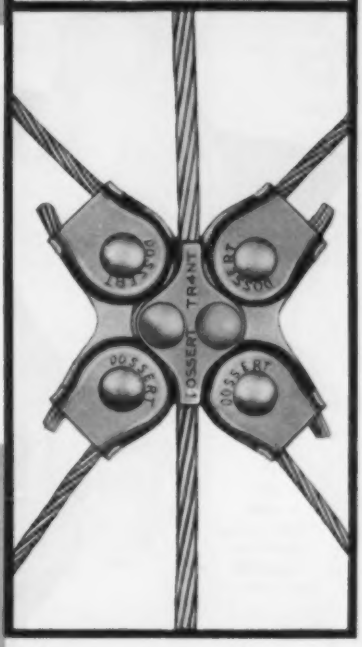
TRIPL-X-TAP*

3-UNIT CONNECTOR

FOR SELF-SUPPORTING SECONDARY AND SERVICE DROP CABLE

*U.S. pat. pend.





NEUTRAL CONNECTOR

INSULATED CONNECTOR

Forget about hand-taping . . . about complicated residential hook-ups!

Dossert's new TRIPL-X-TAP 3-Unit Connector—for conductors of copper or aluminum or both—saves labor and installation costs . . . insures the most dependable connections possible.

TRIPL-X-TAP or its components can also be used on open wire systems.

Two Insulated Connectors plus a Neutral Connector comprise the compact, low cost TRIPL-X-TAP "package". No need to remove insulating cover for subsequent connects or disconnects. No secondary spool racks or costly extra hardware. TRIPL-X-TAP installations insure positive electrical joints and through use of supporting neutrals guarantee mechanical permanence. The insulated connector housing is made of high strength, high impact Bakelite composition, affording better insulation and protection.

† Courtesy of Long Island Lighting Co.

50 YEARS OF TECHNICAL KNOW-HOW

Write for details and prices today.

DOSSERT MANUFACTURING CORP.

249 Huron Street, Brooklyn 22, N. Y.

Since 1904

GUARANTEED FOR 6,000 HOURS!

amplex
Mercury Vapor Lamps

The Amplex guarantee on these widely-used lamps is iron-clad—no strings attached. **IF ANY AMPLEX MERCURY VAPOR LAMP FAILS WITHIN THE 6,000-HOUR GUARANTEE PERIOD, A PROMPT PRO-RATA CREDIT IS GIVEN.**

More and more, municipalities and utilities are turning to Amplex Mercury Vapor Lamps for these reasons:

- *Twice as much light for wattage consumed.*
- *Burning life several times longer than incandescents.*
- *Greater, more dependable illumination is a proved deterrent to crime, traffic accidents and pedestrian injuries.*

For greater lighting efficiency and economy, write for full information on the amplex line, including street lighting and traffic signal lamps. Address **amplex Corporation, Dept. EW-3, 111 Water St., Brooklyn 1, N. Y.**

amplex

INDUSTRIAL BRIEFS

Economical electric heating of 22,600 cu ft of office space has been achieved at Byerlyte Corp, Newark, Ohio. Served by twenty-two 1,000-w glass panels, the building is divided into office, locker, and washroom areas and a repair room, each with individual thermostatic controls. The building was comfortable even when outside temperatures dipped to 10F. The company now plans to install electric heating in its building under construction. D. E. Dome, Commercial Industrial Dept, Ohio Power Co, Newark, Ohio.

Electric degreaser, utilizing 13 kw of resistance heaters, has replaced a gas-type unit for Zenith Machine Co, Duluth, Minn. It cleans machined parts in the manufacture of electric washing machines and gear cases. The electric degreaser has proved fast, adaptable, and efficient. It does an excellent cleaning job. Fred E. Stout, Industrial Sales Engineer, Minnesota Power & Light Co, Duluth, Minn.

Heating two offices with 8 kw has improved employee working conditions, even in unusually cold weather, for the Valley Dolomite Co, Bonne Terre, Mo. Replacing several oil circulating heaters, a 5-kw, 480-v unit heats an office 10 x 16 x 8 ft in the plant, and a 3-kw, 240-v unit heats an uninsulated shop office 10 x 8 x 8 ft. The latter office has two outside windows. B. P. Donnell, vice-president, is satisfied with the cleaner, safer electric heat, and says other offices will be heated electrically in the future. Robert E. Enkelmann, Industrial Engineer, Union Electric Co of Missouri, St. Louis, Mo.

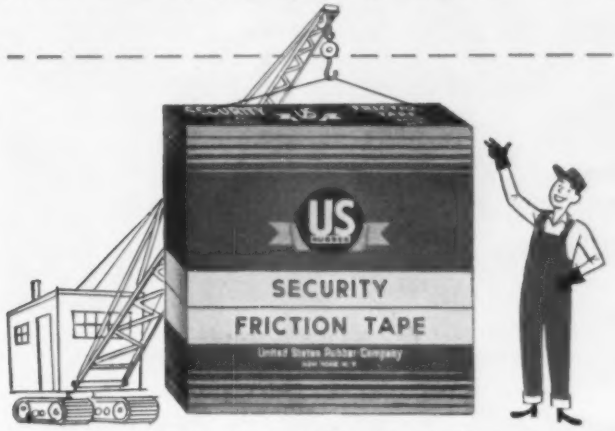
SEND IN YOUR INDUSTRIAL BRIEF

You'll get more satisfaction from knowing your item helped someone else than from the $5 you will be paid for each item accepted. Give us the basic facts covering the application; the name and location of user; benefits, advantages, and load characteristics of the application. Mail to: Industrial Briefs Editor, Electrical World, 330 W. 42 St., New York 36.

Dependability is what you want in tapes—
"Made by U. S. Rubber" means Dependability

Reinsulating and splicing with "U. S." Tapes restore a cable or wire to its original dielectric strength and efficiency. They are made by United States Rubber Company, the only tape manufacturer to grow its own natural rubber and make its own synthetic rubber and plastics. "U. S." has amassed years of experience, research data and skill in the manufacture of tapes that guarantee *dependability* in *any* one of the tapes in the "U. S." Line.

Because the "U. S." Line is complete, you can simplify purchasing by ordering from this *single* line. Order from a selected "U. S." Distributor or any of the 27 "U. S." District Sales Offices.



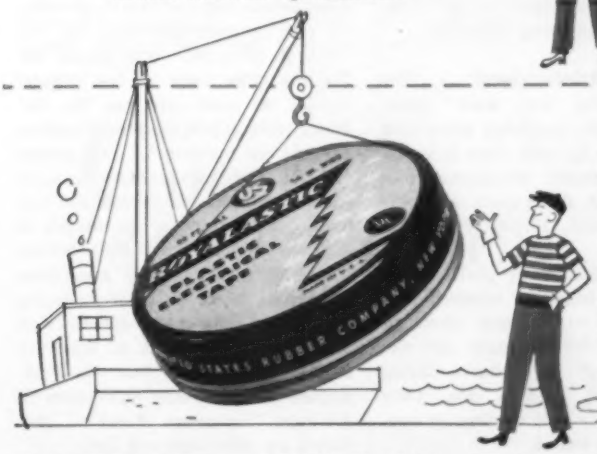
U. S. Security® Friction Tape

A long-time favorite for electrical and general purpose jobs. Strong, tacky tape that grips and stays on. High tensile strength. Straight-tearing, non-ravelling. Also in specification grade—U. S. Holdtite®—exceeds A.S.T.M. Specifications.

U. S. Security Rubber Tape

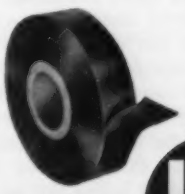
For electrical work. Handles easily and fuses without heat. An unvulcanized rubber splicing compound; Security has high tensile strength, stretch, tackiness, high dielectric strength.

Also in a specification grade—U.S. Holdtite—exceeds A.S.T.M. Specifications.



U. S. Royalastic Plastic Tape

Makes a thin splice that leaves wiring neat and uncluttered. Does the work of both rubber and friction tape on many jobs. Complete mechanical, electrical protection. Good tensile strength and high resistance to abrasion and to water, oils, acids, alkalies, corrosive chemicals. Good stretch and adhesion. Easy to handle. Appr. by Underwriters' Laboratories, Inc.



UNITED STATES RUBBER COMPANY
MECHANICAL GOODS DIVISION · ROCKEFELLER CENTER, NEW YORK 20, N. Y.

US RUBBER

"Operation Redskin" Massacres Company's Old Sales Records

Louisiana P&L's "Red Hot Promotion on Real Cool Services" ups its EAR by $230,000, moves 8,000 refrigeration devices

UGH! HEAP BIG SALES says Louisiana P&L's E. A. Rodrigue, whose division led "Redskin" refrigeration promotion with antics like this

JAMES E. FORT, Assistant Sales Promotion and Advertising Manager, Louisiana Power & Light Co, New Orleans, La.

There was an "Injun" massacre in Louisiana last summer.

Old sales records were wiped out when Louisiana Power & Light Co's sales force donned warpaint and bonnets for "Operation Redskin," a novel promotional activity on refrigeration services. Billed as "a red hot promotion on real cool services," the campaign moved home freezers, air conditioners and other refrigeration devices faster than you can say Geronimo. Result after 10 weeks of tom-tom beating promotion: a thumping 8,000 appliances sold and $230,000 in estimated annual revenue.

A "hard-to-reach" goal of 18 sales per 1,000 residential, farm and commercial customers was set to encourage fast sales sprints throughout the campaign. But even the losing division more than doubled this figure, a happy indication to company officials of the interest generated.

In one division, sales employees produced an Indian skit on refrigeration services which would have made television producers cock an eyebrow. E. A. Rodrigue, division manager, was robed as an Indian chief, Sales Manager J. G. Wilson as a medicine man, and sales personnel as braves and squaws.

And as it ran full force along its Indian trail theme, the campaign ignited the enthusiasm of all employees —sales and non-sales folks alike. Almost every employee who contacted a customer during the campaign squeezed in a few words about food freezers, air conditioners or some other appliance being promoted.

Advertising Reinforcement . . . But employees did not work alone. Throughout the campaign advertising backed them up with three large inserts in 44 weekly newspapers, plus 112 billboards, radio spots, a weekly TV show, and 20,000 direct-mail pieces.

Realizing that many gravity sales would result from the expected high seasonal run on ordinary room air conditioners, the company did not count this type of appliance during the campaign's 10-week run. Only reverse cycle or strip heating air conditioners were tallied.

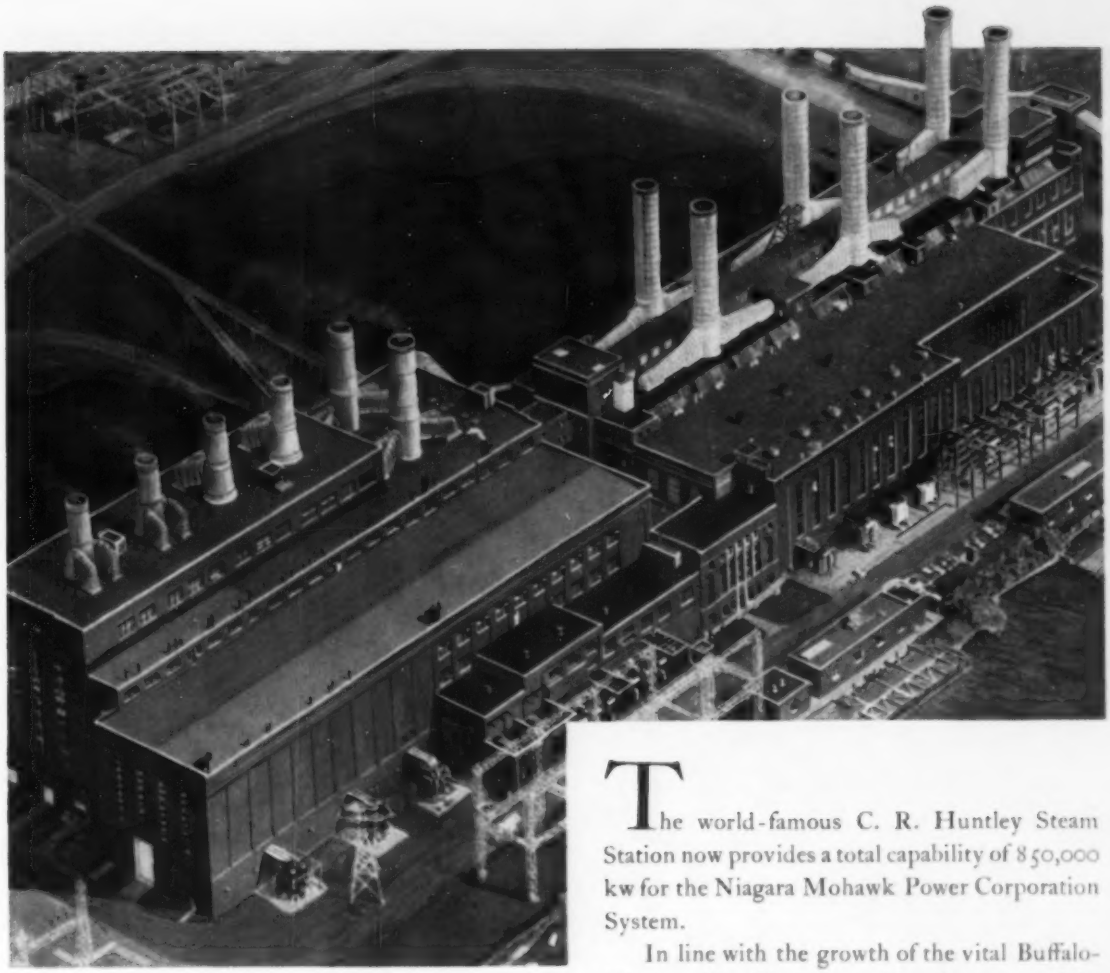
Even so, the year-round room air conditioners were second only to food freezer sales as the final results were marked. The efforts of making every one a salesman paid off to the tune of 1,745 year-round conditioners while food freezer sales reached an eye-blinking 4,000.

Commercial refrigerator cases, thought to be much slower moving items than the campaign later indicated, rang up 1,352 sales. Electric ranges, a side-line issue in this particular promotion, accounted for 479 sales—indicating that two earlier electric cooking campaigns (EW, Oct. 18, 1954, p. 174) still were paying off. For the other items of less popular appeal, the score card ran like this: Water coolers, 349; dairy milk coolers, 47; and ice makers, 45. Altogether, 43.8 units were sold for every thousand residential, farm and commercial customers; a figure never approached in any similar campaign held before.

Overall, the company considered the results to be as pride-producing as a record tulip crop—and twice as pretty. The realization in the forefront, of course, was that when employees are filled with enthusiasm of the type "Operation Redskin" produced, no campaign can fail.

In this, Louisiana P&L believes it holds a key to still bigger sales.

(*More S & S on page* 173)



Two generator units, of the new hollow conductor type, each having a capability of 100,000 kw, have recently been installed at the Huntley Station on the Niagara River, near Tonawanda, N.Y.

Client SATISFACTION

The world-famous C. R. Huntley Steam Station now provides a total capability of 850,000 kw for the Niagara Mohawk Power Corporation System.

In line with the growth of the vital Buffalo-Western New York Area, Huntley—one of the largest thermal power stations in the world—has grown steadily in capacity since 1916.

The original plant was designed and constructed by Stone & Webster Engineering Corporation. The extensions of recent years have been constructed by the Engineering Corporation from designs by Niagara Mohawk's own engineers.

•

Write or call us for information as to how our experience may be of assistance to you.

STONE & WEBSTER ENGINEERING CORPORATION

A SUBSIDIARY *of* STONE & WEBSTER, INC.

New York Boston Chicago Pittsburgh Houston San Francisco Los Angeles Seattle Toronto

TO GIVE YOU BETTER BATTERY PERFORMANCE!

By projecting spectrographic film records on the screen of the Densitometer shown above, Gould research engineers can determine almost instantly the composition of battery metal samples and predict their performance under actual service.

Such "screen tests" together with other test procedures make sure that you get batteries with predictable performance and longer service life.

Gould research has taken the guesswork out of battery-making. Take the guesswork out of battery-buying by choosing GOULD!

America's Finest!
GOULD PLANTÉ
The Aristocrat of
Stationary Batteries

©1955 Gould-National Batteries, Inc.

GOULD
Batteries

"BETTER BATTERIES THROUGH RESEARCH"

GOULD-NATIONAL BATTERIES, INC.
TRENTON 7, N. J.

Always Use Gould-National Automobile and Truck Batteries

How to Sell?

EEI will renew its annual probe of the problem in Chicago next week

Some 57 speakers from all phases of industry will take to the podium in Chicago next week when Edison Electric Institute opens its 21st Annual Sales Conference. Their purpose: To tell more than 1,000 electric utility sales executives how to do a better job of selling.

Conference begins Monday, March 28 in Edgewater Beach hotel with general sessions scheduled for the following Wednesday. From the electrical industry will come such speakers as Presidents Harold Quinton of EEI and Southern California Edison Co, Ralph J. Cordiner of General Electric Co, Philip Sporn of American Gas & Electric Co, Philip Fleger, chairman of the board, Duquesne Light Co and J. H. Jewell, vice president of Westinghouse Electric Corp.

From other fields: Fred Smith, vice president of Gruen Watch Co; J. C. Doyle, sales and advertising manager of Ford Motor Co; Dr. Jules Backman, New York University economics professor and William H. Gove, nationally known sales authority. Ancher Nelsen, administrator, Rural Electrification Administration and Betty Furness, Westinghouse Electric's television sales personality will address special luncheon meetings Tuesday and Wednesday.

Prize Awards presentations will be made at Wednesday's opening general session. O. R. Doerr, vice president of Pacific Gas & Electric Co and chairman of EEI's Commercial Division Sales Committee has charge of the conference.

Electric Cooking, Water Heating Gain in Iowa

Electricity continued to cut into the gas water heating and cooking loads in Iowa homes during 1954 shows a survey of consumer brand preferences just released by the Des Moines "Sunday Register."

Electric ranges are now in 27.6% of total homes as compared with 25.7% in 1953. Ranges served from regular gas distribution systems (called "city gas" by the survey) meanwhile dropped from 36% to 33.8% of the homes. This trend from gas was shown in both city and country residences although use of bulk LP gas increased to 3% in use in rural areas.

Electricity also showed small gains in water heating (40.1% to 41.9% of homes having it) while city gas use for the same purpose fell off slightly (41.5% to 39.5%). In the country, however, the electric way dropped from 70.9% of the homes having water heaters to 68.6%, again mainly at the hands of bulk LP gas.

When it came to drying clothes, gas units gained a full 3% on the farm while electricity fell by the same amount. But in all Iowa homes, electricity plodded ahead from 67.7% of all dryers in use to 68.4%. Gas dropped from 32.3% to 31.6%.

Original Test City Starts Certified Light Program

Indianapolis—city in which a 1949 study showed the sad state of commercial and industrial lighting—is starting a National Lighting Bureau Certification program to change things for the better.

Electrical League of Indianapolis, sponsors of the local program, already has a sales and technical traning program underway and soon will begin promotion and certification activities.

National Lighting Bureau was set up by National Electrical Manufacturers Association after a study using Indianapolis as the test city showed that 85% of the commercial, industrial and institutional organizations there had substandard lighting. It was found that less than 20% of the lighting fixtures in use in these places had been installed since the end of World War II.

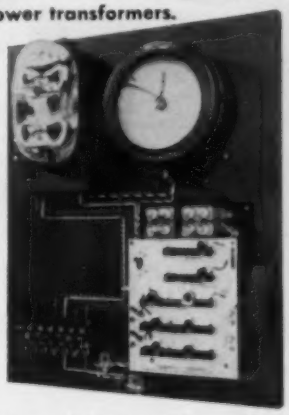
Bureau's program is aimed primarily at the electrical contractor, the man responsible for most lighting sales. It provides him with promotional aids plus training in sales and in laying out lighting that meets bureau specifications. Local bureaus and certified lighting programs are now being organized in various cities across the country. Through its coordinating efforts, the national bureau hopes to improve the quality of lighting everywhere in business and industry.

(*S & S Shorts on page* 174)

Transformer Loss Compensator

Saves you Money!

BECAUSE it provides an accurate means of measuring the energy and demands of high-voltage services at the low-voltage side of the power transformers.

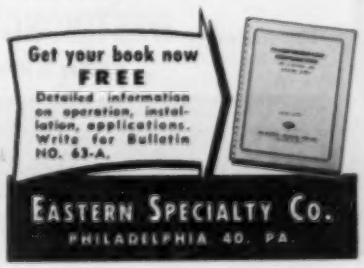


This installation at 2.3 kv saved about $2600 compared with 34.5 kv metering; it saves about $5500 over metering at 69 kv.

THE TESCO *compensator adds to the registration of the watthour meter an amount equal to the sum of the iron and copper losses of the transformer bank. It may be used with practically any type of watthour meter and . . . importantly . . . no changes are made in the meter itself, either structurally or in adjustments . . . It is produced in two and three element types for use with two-element or three-element meters on any type circuit.*

Some of the Users . . .

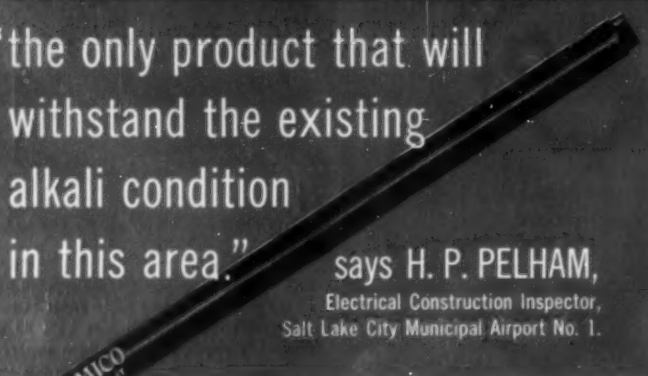
Phila. Electric Co. Penna. Power & Light Co. Texas Power & Light Co. U. S. Bureau of Recl. Public Service Co. of New Hampshire. Utah Power & Light Co. Northern States Power Co.


Get your book now
FREE
Detailed information on operation, installation, applications. Write for Bulletin NO. 63-A.
EASTERN SPECIALTY CO.
PHILADELPHIA 40, PA.

BERMICO® electrical conduit was installed here because it is...

"the only product that will withstand the existing alkali condition in this area."

says H. P. PELHAM,
Electrical Construction Inspector,
Salt Lake City Municipal Airport No. 1.



Protected by over 100,000 feet of Bermico, the cables that light Salt Lake City Airport's new runway are completely safe from all natural attacks.

Made to precise standards of wood fibre impregnated with coal tar pitch, Bermico Lifetime Conduit is alkali-resistant, acid-resistant, light, tight, strong, and uniform from end to end — yet low in cost.

For the best protection for all types of underground wiring systems, follow the lead of leading public utilities and electrical contractors from coast-to-coast. Specify Bermico Lifetime Conduit. Immediate shipment of all sizes and fittings guaranteed.

Distributed by WESTINGHOUSE Electric Supply Company

Offices in principal cities

BROWN COMPANY
Berlin, New Hampshire
GENERAL SALES OFFICE: 150 CAUSEWAY STREET, BOSTON 14, MASS.

S & S Shorts

What Is An Automatic Washer?

The electrical industry should attempt to standardize definition of the term "automatic washer", say members of the Laundry Equipment Committee of the National Association of Electrical Distributors. The public is confused by the numerous definitions now in use, they declare and this confusion obstructs merchandising efforts.

Home Laundry Shows Pushed

Dealers across the nation find that for every three people who see an actual home laundry demonstration, one sale results, declares E. S. Sorenson of Hotpoint Co. To encourage more store demonstrations Hotpoint has started a 90-day "Dough for Demonstrations" program among its dealers. Incentives will be in the form of cash, promotional materials, and trips for dealers to Las Vegas.

Markets Ceramic Coated Lamp

A ceramic coated lamp, claimed to shed a softer light than conventional frosted ones, is now being marketed by Sylvania Electric Products, Inc in the 11 western states. It will be given national distribution about the end of this year when production facilities are expanded.

Home Heat Classes Slated

Home heating training sessions will be held in 91 U. S. and seven Canadian cities this year by representatives of General Electric Co's Home Heating & Cooling Department. The three-day meetings provide instruction in application and service of home heating equipment for distributors, dealers and other servicing organizations.

Lots of Room for Sales

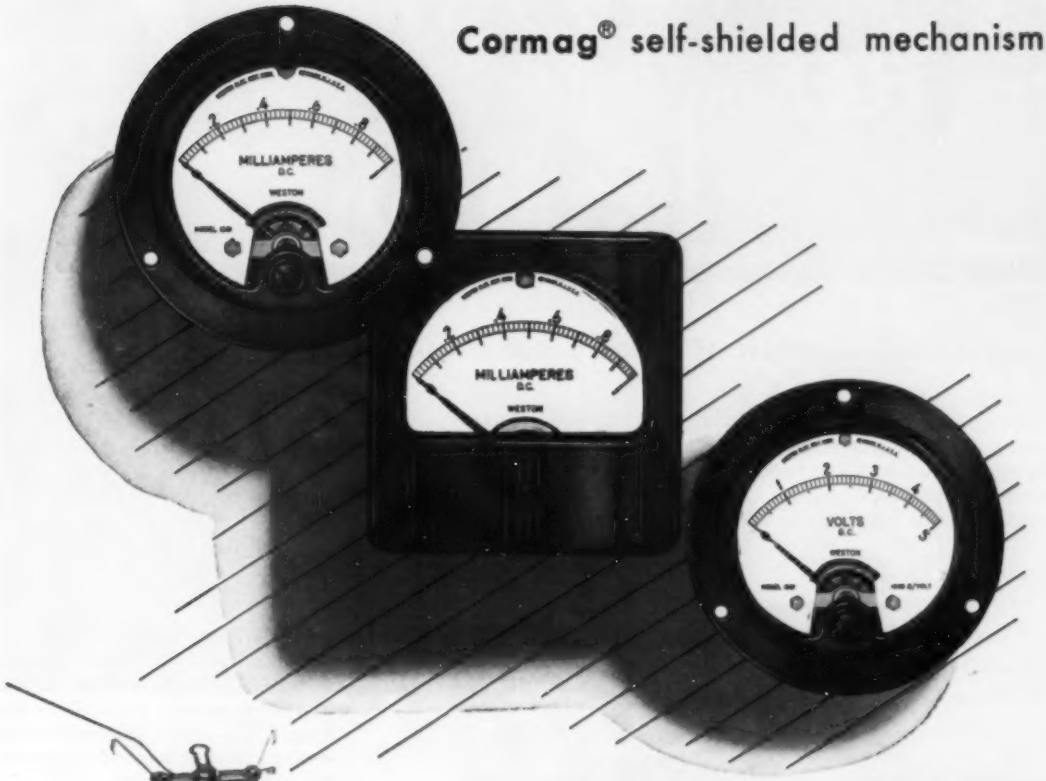
One out of five of its farm home subscribers still has neither an electric nor a gas range, reports "Capper's Farmer" from facts gained in a recent survey.

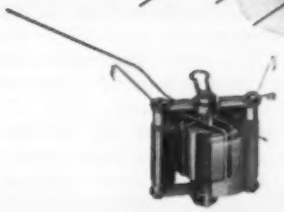
Transformer Bulletin

Transformers for mercury lamp street lighting are presented in detail in a new bulletin published by Jefferson Electric Co. For copies write Jefferson at Bellwood, Ill.

NEW in design concept...in dependability

Weston 1301 line panel instruments with Cormag® self-shielded mechanism





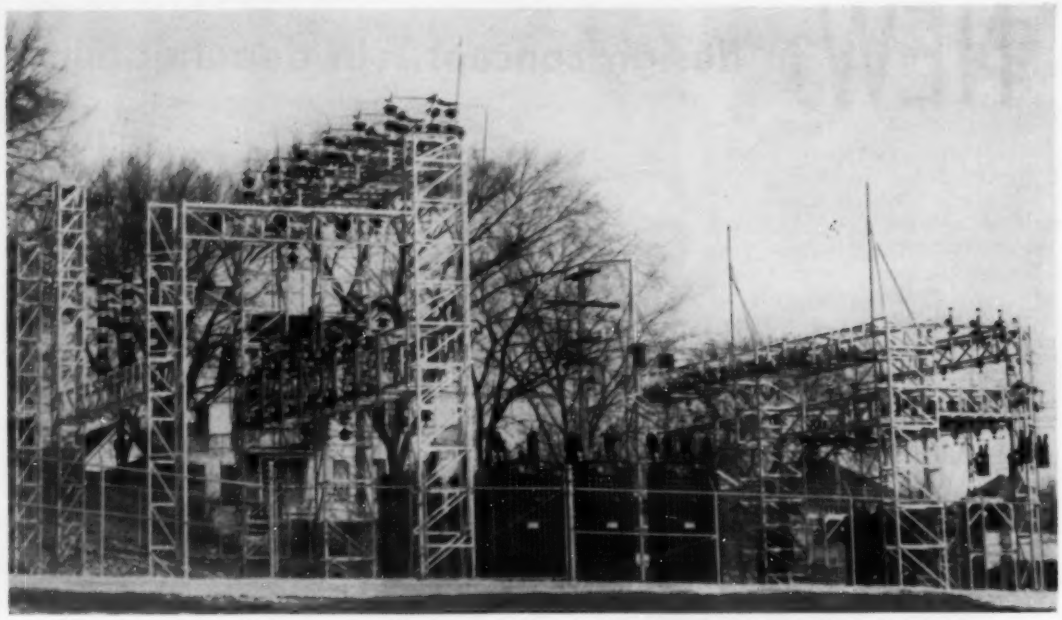
Weston CORMAG® Mechanism (shown in combination cutaway and phantom)

A compact, lightweight permanent magnet moving-coil mechanism, self-shielded from the effects of external magnetic fields.

The 1301 line (3½") furnishes panel instrument users with the added dependability, the mounting facility, and the new economy which CORMAG self-shielded construction provides. These instruments can be mounted on magnetic or nonmagnetic panels interchangeably, and there is no magnetic intereffect of instruments on one another when mounted in close proximity. For complete information, see your local WESTON representative or write... WESTON Electrical Instrument Corporation, 614 Frelinghuysen Avenue, Newark 5, N. J.

WESTON instruments

NEW EQUIPMENT



Packaged Substations Ready For Field Erection

Complete, outdoor, packaged substations are being offered in standard designs at any kva capacity. All components, from the incoming-line strain insulators to the outgoing low-voltage feeder terminals, are coordinated to provide a standardized package.

Substations include a newly designed galvanized steel structure that affords ease of installation, economy of steel, and versatility of application. The structure is completely prefabricated and shipped disassembled for field erection. Erection, foundation, and arrangement drawings accompany a disassembled structure.

Line Material Co, Milwaukee 1, Wisc.

Meter Tester

High accuracy with stability of performance over a wide range in testing portable standard watthour meters (rotating standards) is offered by the Type RST-2 Knopp Uniload rotating standard testing equipment, according to the manufacturer.

Multirange current and potential transformers permit reference rotating standard to receive known multiples or fractions of selected test currents and voltages. Standards always operate at full load and full rated-voltage. Precision transformers work at full excitation.

Test voltages of 120, 240, and 480 are provided and others are available. There are 24 current ranges from 0.25 to 100 amp. Tests can be made from 1 to 30% power factor.

Electrical Facilities Inc, 4236 Holden St, Oakland 8, Calif.

(*More New Equipment on page* 178)

Match those long-life poles with long-life guys!

—it lasts as long as the poles

Let's face it. Modern poles last 30 to 40 years—and more. So, it's just common sense to use guy strand that lasts as long as the poles. The cost of the strand is a small part of the installation. Invest just a little more for Copperweld* Guy Strand and get a lot more service at lower annual cost.

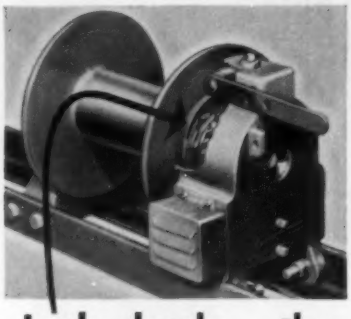
*Trade Mark

COPPERWELD STEEL COMPANY
WIRE AND CABLE DIVISION
Glassport, Pa.
For Export: COPPERWELD STEEL INTERNATIONAL COMPANY, New York

1955
—our 40th year

Copperweld GUY STRAND

Now...a 7000-lb. winch with Big-Winch-Features



Look closely...the *Secret's Inside!*

Here, at last, is an improved light-duty Gar Wood winch that positively ends the old-time headaches of sticking, freezing, rusting — because all moving clutch parts are *fully enclosed and running in oil.* Neither weather nor dirt can ever get in. Your operator also has much *safer control of the load,* thanks to Gar Wood's exclusive self-energizing safety brake, and time-tested backdraft clutch, which eliminates the hazard of sudden slippage.

More GW plus values

New rust-proof aluminum housing means lighter weight, longer life... dissipates heat much faster than steel. In addition, extra rugged base angles insure a margin of safety many times the rated capacity of the winch. New "built-in" rope clamp also simplifies attaching and changing rope... eliminates U-bolts and other projections that tend to foul spooling. See these great new 7000-lb. winches – standard or low mount – at your Gar Wood distributor today.

GAR WOOD *Winches*

GW-W-1

MAIL COUPON FOR QUICK ACTION

Gar Wood Industries, Inc.
Main St., Wayne, Michigan

☐ Send free literature on new 7000-lb. Gar Wood Winch

☐ Std. Mount ☐ Low Mount

Name .....

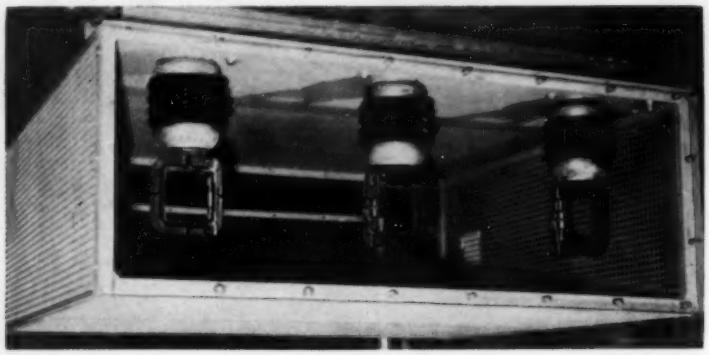
Title .....

Company .....

Address .....

New Equipment

(*Continued from page* 176)

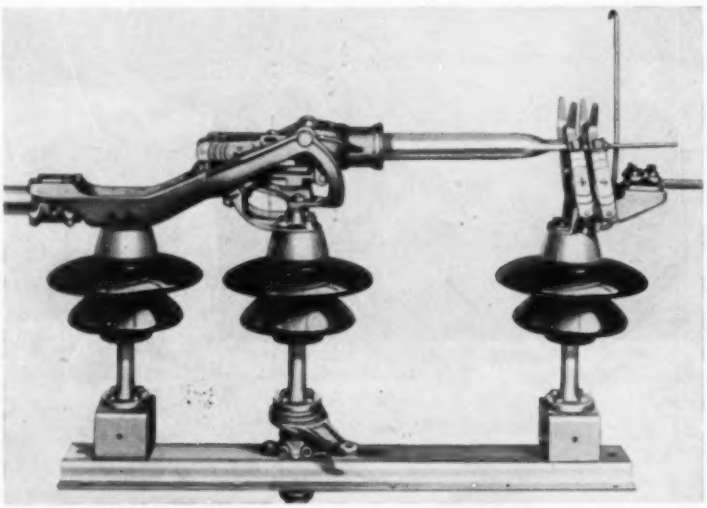


Bus Duct

Perforated aluminum enclosures are used on sides and bottom of 15.5 kv, non-segregated phase bus duct designed for generator main leads. Bottom covers are removable for conductor installation and maintenance. Ventilated square copper tubing rated 6,000 amp is used for main conductor.

Heavy duty, outdoor type bus supports are rated 5 kv on indoor sections and 23 kv on outdoor sections. Duct sections are designed to mount on structural members and are shipped completely assembled.

Delta-Star Electric Div, H. K. Porter Co, Inc, 2437 Fulton St, Chicago 12, Ill.



Disconnect Switch

A 1200-amp, outdoor, group-operated, vertical break disconnect switch is latest addition to a line of 400- and 600-amp switches. Type PV switches are rated from 7.5 to 69 kv for sectionalizing, disconnecting, or bypassing applications. They are designed for either pole or structure mounting in a horizontal, vertical, or inverted position. A horizontally mounted switch has horn gaps for interrupting light load, magnetizing, or charging currents.

Switches feature silver-to-silver high-pressure contacts, silicone greased bearings, rotating switch blades with a powerful lever advantage, and a minimum number of current interchange points. Adjustable terminal clamps accommodate a wide range of conductor sizes.

Line Material Co, Milwaukee 1, Wisc.

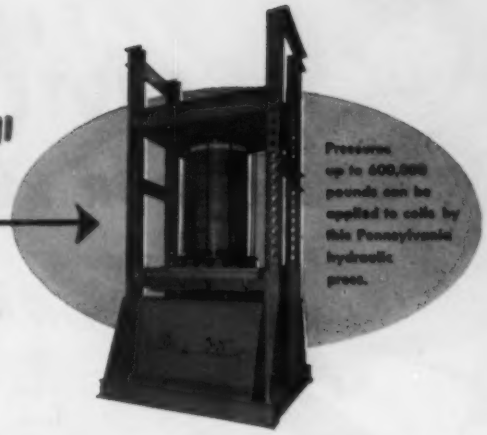
(*More New Equipment on page* 180)

Over 15 years' experience in

"Putting on the Pressure"

is your proof that your

PENNSYLVANIA Power TRANSFORMER

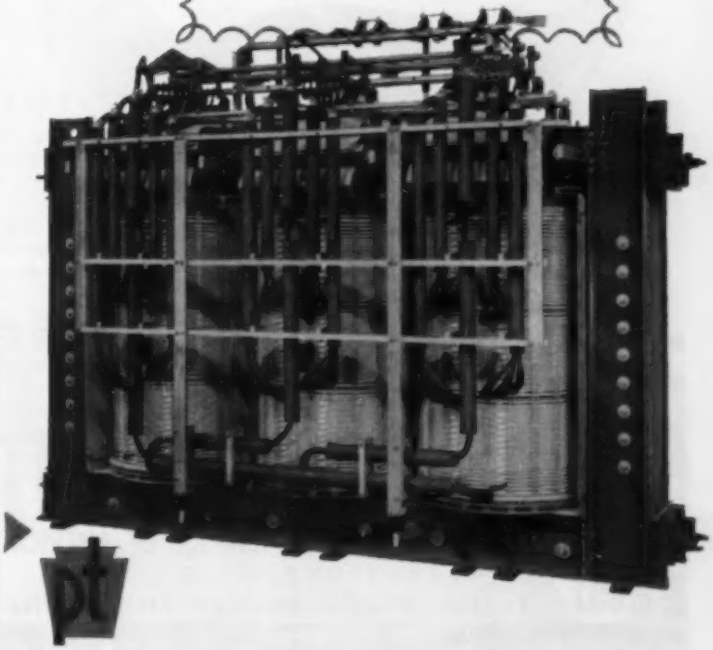


will withstand short circuits

When a large power transformer is subjected to a short circuit, a force of several hundred thousand pounds may be imposed axially on its coils. Of course, these short circuit forces are taken into account in the design of each transformer. But at Pennsylvania, "proof on paper" is not enough. Positive action is taken to be absolutely certain that your transformer will withstand short circuits. Putting on the pressure is the added measure of safety engineered into every helical and pancake coil. Pennsylvania engineers calculate the total short circuit force that would be produced by a short circuit at the secondary terminals with the rated voltage maintained on the primary. Each coil is then compressed with this predetermined force. Finally, the coil is treated in such a manner that it will maintain its compressed size and shape when mounted on the core.

This idea, as well as this method of precompressing coils, was devised by Pennsylvania Transformer Company over 15 years ago. It has been a regular step in Pennsylvania's manufacturing process ever since then.

The fact that the transformer coils maintain their shapes under the prescribed pressure is your guarantee that the transformer will withstand short circuits.



Core and coil unit of 20,000 Kva, three phase transformer. Strong supports are provided at the top and bottom of the coils to keep the coils in their precompressed shapes. No movement can take place in these transformer coils, even under the most severe short circuit.

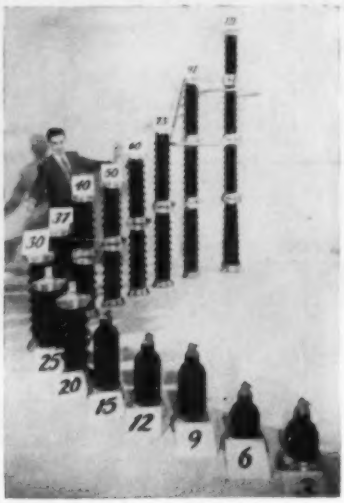
PENNSYLVANIA TRANSFORMER COMPANY • **BOX 330, CANONSBURG, PENNSYLVANIA**

A McGraw Electric Company Division

FIRE
PROTECTION
IS OUR BUSINESS!
"Automatic" Sprinkler
At "Automatic" Sprinkler, the design, manufacture, installation and maintenance of Engineered Protection for all fire hazards is our constant concern — our basic business objective.
We consider our task of preserving lives, property and money as a full-time job — rewarding to our customers . . . of substantial benefit to the growth and strength of our nation.
A
"AUTOMATIC" SPRINKLER CORPORATION OF AMERICA
YOUNGSTOWN, OHIO
Offices in Principal Cities of North and South America

New Equipment

(*Continued from page* 178)



Lightning Arresters

A series of lightning arresters are said to provide 20% lower discharge voltage and 10% lower sparkover voltage than preceding models. Thyrite Magne-valve line-type arresters employ the principle of magnetic action aiding valve action. This permits discharge of lightning or surge currents through valve elements to ground and extinguishes power-follow current by the action of magnetic coils exerting an arc-quenching force in the arrester gap. Improved Thyrite valve disks have low resistivity (for low IR discharge voltage) and increased discharge capacity.

Range of the new series has been extended to include ratings from 3 to 121 kv.

General Electric Co, Schenectady 5, N. Y.

Meters

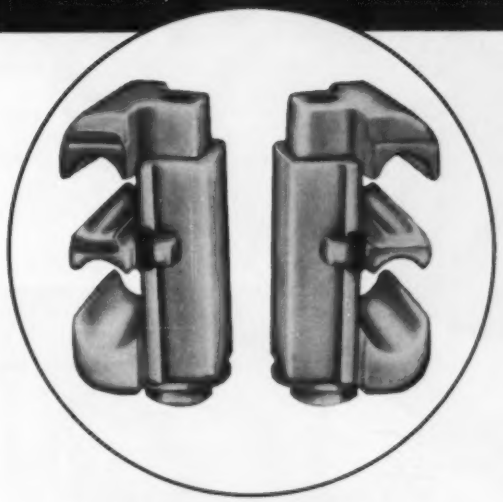
Portable instrument gives accurate measurements of electric power from 60 to 500 cps. Model 90-A, a volt, amp, wattmeter (illustrated), has ranges of: 150, 300, and 600 v; 1.5, 5, 15, 50, and 150 amps; 150 w min full scale to 60 kw max. For 3-phase power measurement, wye connected voltages give true power for balanced current.

Model 90-P, a polyphase wattmeter, utilizing two phases of current and

(*Continued on page* 182)

...EVEN HOT...

"One Piece" FARGO CONNECTORS ARE EASY TO INSTALL



FARGO'S "9000 SERIES" FOR MAXIMUM PERFORMANCE IN SERVICE

Fargo's aluminum-bodied connectors have extra wide contact areas to overcome the high resistance of surface oxides and minimize cold flow. Larger mass gives additional radiating surfaces to hold the connector temperature under that of the conductors even under high fault currents. Well rounded corners and parabolic jaws minimize conductor damage due to physical distortion or nicking.

The soft pure aluminum spacer bar forms around the conductor excluding moisture and is a low resistance path between conductors . . . wide separation of the conductors minimizes the possibility of an electrolyte bridging the gap between the dissimilar metals.

The natural resilience of the connector body plus Fargo's exclusive vibration proof design maintains more than adequate pressure after repeated cycling. Fargo "9000 Series" connectors are available up to 397,500 ACSR.

Ask your Line Material Field Engineer for complete details.

RUBBER GROMMETS HOLD SPACER IN POSITION FOR EASE OF INSTALLATION

For hot work Fargo's "9000 Series" aluminum bodied vise type connectors are available with soft flexible grommets which hold the spacer bar in an open position so the run and tap conductors may be installed with ease. The grommets are out of the current paths between the conductors and do not interfere with the smooth easy operation of the clamp.

It is the easiest spacer bar clamp to install because it is "one piece" . . . no extra parts to assemble or threads to engage. Both hands are free to operate the hot stick.

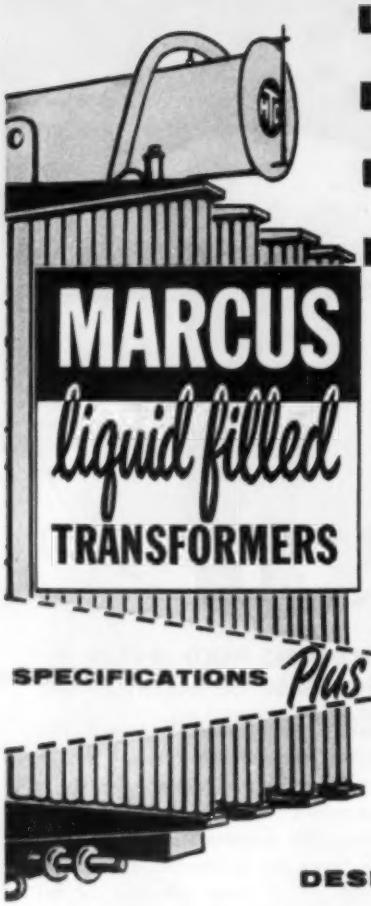
Tool #72 courtesy of Safety Line Line Tool Company, Oakland, California. Others are available.

FARGO

Manufactured by
FARGO MFG. COMPANY, INC.
Poughkeepsie, N.Y.

Distributed by
LINE MATERIAL COMPANY
(A McGraw Electric Company Division)
Milwaukee, Wisconsin

LM



LONGER LIFE
DEPENDABLE
EFFICIENT
ECONOMICAL

MARCUS
liquid filled
TRANSFORMERS

SPECIFICATIONS Plus

DESIGNED FOR Quality

OIL IMMERSED, ASKAREL & DRY TYPE TRANSFORMERS
Capacities 1 to 5000 KVA

- POWER
- DISTRIBUTION
- UNIT SUBSTATION
- GENERAL PURPOSE
- PHASE CHANGING
- ELECTRIC FURNACE
- RECTIFIER
- WELDING
- MOTOR STARTING
- SPECIAL

MARCUS transformers have been proven in the field by year after year of safe, trouble-free service. Leading engineers choose them for rugged dependability. At MARCUS there is no compromise with quality. Sound engineering and skilled production result in transformers that have set a new standard for the industry. The MARCUS seal on a transformer is your guarantee that you have bought the best. It is truly *"The Mark of Quality"*.

"Mark of Quality"

Representatives in Principal Cities

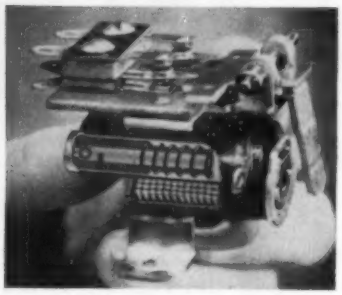
—MARCUS—
TRANSFORMER CO., INC.
RAHWAY, NEW JERSEY

New Equipment

(*Continued from page* 180)

three phases of voltage has ranges of: 150, 300, and 600 v; 1.5, 5, 15, and 50 amp; 300 w min full scale to 40 kw max.

Model 90-PR has the same ranges and in addition reads vars directly. **Niagara Electrical Instrument Co, 559 Ellicott St, Buffalo 3, N. Y.**



Time Delay Relay

High speed action with substantial pressure reduces contact resistance of time delay relay. This action results from spring loading of the armature and increased magneto-motive force as compared with earlier relays. Variable flux operation, caused by changing relationship of a solenoid coil and its core produces the definitive contact action. Standard time delays are from 0.25 to 120 sec.

The Type A Silic-O-Netic relay utilizes a hydraulic-magnetic principle in which silicone fluid is the basis of time delay. When the solenoid coil is energized the core is drawn into the resulting magnetic field. Silicone fluid slows the rate of core travel, thus controlling the response time. Contacts are actuated as the core touches the

(*Continued on page* 184)

ROEBLING PAPER POWER CABLE WITH TELLURIUM LEAD ALLOY SHEATH

YOU WANT

- *EXTRA FATIGUE RESISTANCE,*

PLUS

- *LOWEST LONG-TIME CREEP RATE,.*
- *HIGH BURSTING STRENGTH,*
- *TOP STABILITY UNDER HEAT,*
- *ABOLITION OF FREQUENT STOP JOINTS OR REINFORCED LEAD SHEATH,*
- *ABOLITION OF NEED FOR GENEROUS EXPANSION BENDS OR LARGE MANHOLES...*
- *THE DEPENDABILITY ASSURED BY OUR EXCLUSIVE MANUFACTURING, TESTING AND FIELD EXPERIENCE...*

IN SHORT,

YOU WANT

ROEBLING

Subsidiary of The Colorado Fuel and Iron Corporation

JOHN A. ROEBLING'S SONS CORPORATION, TRENTON 2, N. J. BRANCHES: ATLANTA, 934 AVON AVE. • BOSTON, 51 SLEEPER ST. • CHICAGO, 5525 W. ROOSEVELT RD. • CINCINNATI, 2253 FREDONIA AVE. • CLEVELAND, 13235 LAKEWOOD HEIGHTS BLVD. • DENVER, 4801 JACKSON ST. • DETROIT, 915 FISHER BLDG. • HOUSTON, 6216 NAVIGATION BLVD. • LOS ANGELES, 5340 E. HARBOR ST. • NEW YORK, 19 RECTOR ST. • ODESSA, TEXAS, 1920 E. 2ND ST. • PHILADELPHIA, 230 VINE ST. • SAN FRANCISCO, 1740 17TH ST. • SEATTLE, 900 1ST AVE. S. • TULSA, 231 N. CHEYENNE ST. • EXPORT SALES OFFICE, TRENTON 2, N. J.

THE FIRE THAT BURNED ITSELF OUT AND COST $1,450,000

A sudden flash from vaporized oil (in the turbo-generator area) followed by an intensely hot fire made it impossible to approach with first aid fire appliances . . . When the fire had *burned itself out,* unprotected steel roof trusses 50 feet overhead had collapsed and about 6000 sq. ft. of the concrete roof of the *non-combustible* building had fallen in.

Damage, $250,000
. . . since the power plant was shut down, *the electric fire pump* supplying the yard hydrants was *out of service*.

Damage, $520,000
. . . the fire department was able to obtain enough water . . . at a reservoir to put out the fire *in an hour*.

Damage, $200,000
. . . fire fighting was delayed until all switches were pulled and high voltage lines from the building were cut. By then the entire building was in flames.

Taken from
NATIONAL FIRE PROTECTION ASSOCIATION BULLETIN FR 55-1—
"OCCUPANCY FIRE RECORD—ELECTRIC GENERATING PLANTS"—Gives more details on these and 33 other fires in generating stations. Procurable from National Fire Protection Association, 60 Batterymarch Street, Boston 10, Massachusetts. Price, 50 cents.

These case histories tell their own story—that in generators, transformers, switching equipment and other danger spots, fire can strike and cripple—with ordinary or "outside" protection hopelessly inadequate.

That is why CARDOX Fire Extinguishing Systems* and CARDOX *Low* Pressure Carbon Dioxide now protect 14 of the 25 largest generating companies in the United States. Standing guard day and night, regardless of power or personnel failures, they protect millions of dollars in property—provide positive assurance that *fire* damage will be held to a minimum, and extinguishment damage eliminated entirely. CARDOX hurts nothing but fire!

Why not have a CARDOX survey and recommendation on CARDOX Low Pressure Carbon Dioxide Protection for your hazards? No cost or obligation, of course.

*Covered by U.S. and Foreign Patents issued and pending.

CARDOX
Originator of Low Pressure Carbon Dioxide
FIRE EXTINGUISHING SYSTEMS

CARDOX CORPORATION • Bell Building • Chicago 1, Illinois
Offices in Principal Cities

New Equipment

(*Continued from page* 182)

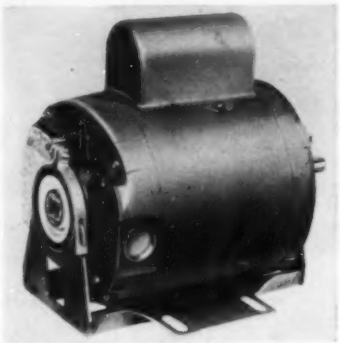
pole piece.

Relays are furnished with coil ratings from 24 to 240v ac and 6 to 125v dc. Ask for Bulletin T-5002.
Heinemann Electric Co, 440 Plum St, Trenton 2, N. J.

Wire Rope

A line of steel core wire ropes is claimed to handle heavier loads for longer periods due to its increased strength over previous grades. Laboratory tests as well as on-the-job observations, over several years, have proved the rope has high resistance to wear from bending and abrasion, contributing to longer life.

Available rope sizes range from 1.25 to 3.5 in.
John A. Roebling's Sons Corp, Trenton 2, N. J.



Fractional HP Motors

Fractional hp motors in NEMA 48-frame sizes are smaller and lighter than NEMA 56-frame motors having the same ratings. On single phase motors, the terminal board design permits change of voltage or motor reversal by interchanging quick-disconnect plugs in motor conduit box. Flexible leads between windings and terminal board are eliminated, since coil leads are connected directly to the board which is rigidly mounted on the wound primary.

Motors are available in resilient and rigid mountings.
Westinghouse Electric Corp, Box 2099, Pittsburgh 30, Pa.
(*More New Equipment on page* 186)

A LEADING UTILITY EXECUTIVE REPORTS TO HIS MANAGEMENT AFTER INSPECTING OUR PLANT AND FACILITIES

"small enough to be flexible and take care of emergency and rush business . . . large enough to handle quantity shipments in a reasonable time."

Quality You Can Trust

You, too, will find that Porcelain Products' manufacturing facilities are in constant readiness to handle your insulator requirements. We'll be honored to have you come and visit us—inspect our facilities, meet true ceramic craftsmen. But whether you can visit our plant, or not, the *quality* and *performance record* of Porcelain Products' High Voltage insulators signify a depth of manufacturing know-how, research, and individual craftsmanship—working in unison to give you better insulators—with plus values. Visit us, and you'll see why *you* can rely upon Porcelain Products to fill your immediate or long-range insulator requirements *today . . . tomorrow . . . anytime!*

Export Representative: Philips Export Corp., 100 E. 42nd Street, New York 17, N. Y.

61 years

YOUR INDEPENDENT INSULATOR MANUFACTURER

Porcelain Products, Inc.

PP —INC.—

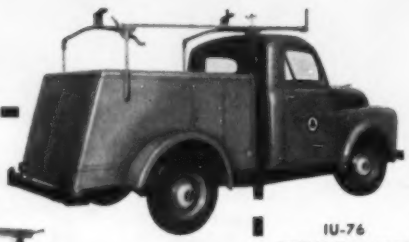
PARKERSBURG, WEST VIRGINIA

HIGHWAY

LINE CONSTRUCTION AND MAINTENANCE EQUIPMENT

HC EARTH BORING MACHINE

MW-128 UTILITY TRUCK BODY



IU-76 INSTALLER'S UNIT

PWD-2 CABLE REEL TRAILER

Highway line construction and maintenance equipment — designed for safety, dependability, economy and long, trouble-free service life — the most completely engineered equipment available today.

That's the reason Highway equipment is more widely specified and used than *any other*. Highway's complete, experienced engineering service and extensive production facilities mean the right solution to *your* problems too! Call, wire or write for full information and specifications today.

HIGHWAY TRAILERS

HIGHWAY TRAILER COMPANY

HEADQUARTERS: EDGERTON, WISCONSIN

MANUFACTURERS OF:

Commercial Trailers • Trailerized Tanks and Dry Bulk Haulers • Public Utility Bodies • Earth Boring Machines • Pole and Cable Reel Trailers • Winches • Power Take-Offs • Service Accessories

SALES AND SERVICE IN PRINCIPAL CITIES

New Equipment

(*Continued from page* 184)

Tap Connector

Vice type connectors have soft flexible rubber grommets to hold spacer bar in open position so that run and tap conductors may be easily installed on live lines with hot stick tools. Grommets are out of current paths between conductors and do not interfere with smooth operation of the one piece spacer bar clamp.

Aluminum-bodied connectors have extra wide contact areas to overcome high resistance of surface oxides and minimize cold flow. Large radiating surfaces hold connector temperature under that of conductors. Soft aluminum spacer is a low resistance path between conductors. Wide separation of conductors minimizes possibility of an electrolyte bridging gap between dissimilar metals.

Fargo "9000 Series" connectors accommodate conductors from No. 4 to 4/0 ACSR. They are distributed by Line Material Co, Milwaukee, Wisc. **Fargo Mfg. Co, Inc, Poughkeepsie, N. Y.**

Cable Troughs

Unsupported spans up to 10 ft. are possible with strong lightweight cable troughs made of 14 gauge steel. Cross bracing for transverse strengthening is eliminated by 1 x ½ x ½ in. channel

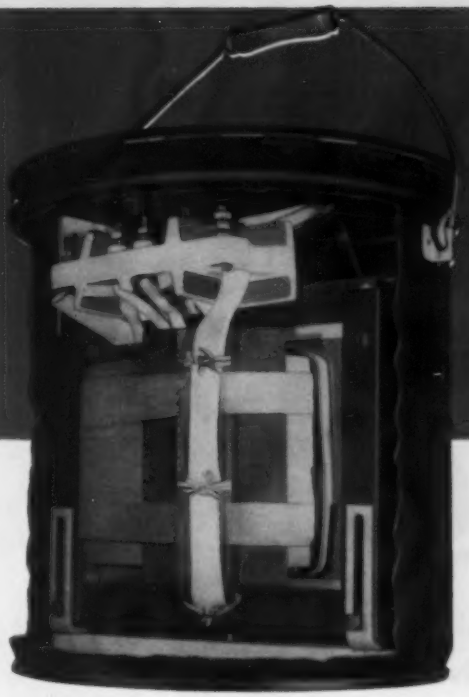
(*Continued on page* 188)

Here's how to

Renew burned-out Transformers—

Quickly, Easily, Inexpensively

Wagner Replacement Core and Coil Assemblies come to you *Ready to Install* —without testing or drying—packaged in transformer oil for complete protection



Wagner packaged transformer core and coil assemblies are brand new elements, exactly like those used in new Wagner Transformers. They are made with preformed cores of cold-rolled oriented-grain steel (Wagner Form W Construction) which are considerably smaller than the old hot-rolled silicon steel cores. This means that in many cases you can up-rate as well as renew your old or burned-out transformers. They are available in ratings from 3 through 167 kva.

These replacement elements come ready for use—fully dried and tested—protected in a sealed container filled with Wagner 7-NI inhibited transformer oil, which you may also use in your tank.

Installation is easy... the assemblies are complete with terminal board or tap changer, with leads ready to install in your tank. Each assembly has a new serial number and name plate.

Wagner
Bushing Assemblies

High Voltage Bushing Assembly

Available in cover-mounted or tank wall mounted types to meet a wide range of requirements. Gasket, solderless connector-type terminal and clamping devices are included—fuses can be furnished when specified.

Low Voltage Bushing Assembly

Ready to install—includes porcelain bushing, gasket, solderless connector-type terminal and clamping device.

Field Repair Service for Substation Transformers

Wagner's Transformer Service Trucks—completely equipped for field repairs—each with the services of an expert—are available on schedule in most localities. The cost of this exclusive Wagner service is nominal—write for information.

WAGNER ELECTRIC CORPORATION
6456 Plymouth Ave., St. Louis 14, Mo., U.S.A.

Wagner Electric Corporation EST. 1891

ELECTRIC MOTORS • TRANSFORMERS • INDUSTRIAL BRAKES
AUTOMOTIVE BRAKE SYSTEMS • AIR AND HYDRAULIC

BRANCHES IN 32 PRINCIPAL CITIES

TS 53-1

For that EXTRA SAFETY FACTOR

in OVERHEAD GROUND WIRES

Crapo

Weldless
Galvanized
STEEL STRAND

MAXIMUM STRENGTH and dependability in overhead ground or static wire is assured when you specify *Crapo* Weldless Galvanized Steel Strand, specially designed and manufactured to shield transmission lines against lightning.

CONTINUOUS LENGTHS of this 7-wire strand are produced without welds or joints of any kind in either the individual wires or finished strand. High fatigue endurance provides that extra factor of safety so important in overhead ground wire. Laboratory-controlled manufacturing constantly insures high, uniform quality to make it your most practical and economical strand for this purpose.

Crapo GALVANIZING applies a dense, uniform and ductile zinc coating, tightly bonded to the wires for lasting protection against corrosion. *Crapo* Weldless Galvanized Steel Strand is available with Class A, B or C coatings in approved sizes and grades.

Ask your *Crapo* representative for Booklet DG-25 containing Sag and Tension data . . . or write direct!

INDIANA Steel & Wire Co., Inc.
MUNCIE, INDIANA

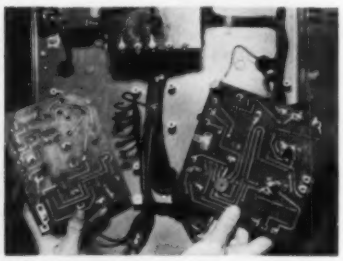
New Equipment

(*Continued from page* 186)

type bottom struts. Slat designed bottom permits a drop out to be made at will and carried up or down through any number of superimposed horizontal runs.

Cable Way is supplied in 6, 12, 18, and 24 in. widths and in standard 8 and 12 in. lengths. It can be cut to length at any point by cutting the side channels. A universal splice plate joins all parts through side channels without involving the tray bottom. Standard fittings, horizontal elbows, inside and outside vertical elbows, tees, crosses, and covers are available. All components are hot galvanized after fabrication.

The Globe Co, 4000 S. Princeton Ave, Chicago 9, Ill.



Motor Control

Printed circuits and a simplified control system are used in automatic electronic control for dc motor drives. Thy-mo-trol controls are designed to give stepless speed control from an ac power source over an 8 to 1 speed range. Higher ranges are possible for special applications. The unit maintains very close speed regulation regardless of changes in load or line voltage and limits starting torque to protect both drive and machine against overloads at all times.

The control circuit uses a single miniature-type control tube with 40% greater capacity than the full load current of the motor with which it is

(*Continued on page* 190)

VICTOR "KNOW-HOW"

Plus

Purified Porcelain

...Give You America's Finest Pintypes!

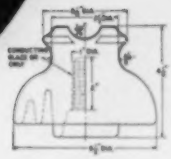
VICTOR Low Voltage Pintypes are the result of the combined "know-how" acquired through ceramic, electrical and mechanical research.

VICTOR Pintypes are made of *Purified* Porcelain, finest insulator porcelain ever made! They are designed with rugged cross section for maximum strength and resistance to impact. They have large-radius top and side wire grooves to permit use of new larger conductors, and smooth hard glaze for maximum self-cleaning in contaminated areas. Every insulator is thoroughly tested to assure continuity of service.

VICTOR Pintypes last longer, cut line maintenance costs to a minimum. You'll save money by specifying VICTOR.

FEATURES

1. **PURIFIED PORCELAIN** provides highest dielectric and physical strength.
2. **RUGGED CROSS SECTION** gives maximum strength and resistance to impact.
3. **RESEARCH-ENGINEERED DESIGN** minimizes outages.
4. **LARGE-RADIUS TOP AND SIDE WIRE GROOVES** permit use of new larger conductors.
5. **MECHANICALLY APPLIED GLAZE** results in high strength with smooth, self-cleaning surface.
6. **ACCURATE PINHOLE GAUGING** —every lot must pass NEMA standards for pinhole thread accuracy.
7. **ROUTINE ELECTRICAL FLASHOVER TEST** is given every pintype before shipment.



Specifications

60 cycle Dry Flashover	70 KV
60 cycle Wet Flashover	40 KV
Pos. Impulse Flashover*	110 KV
Neg. Impulse Flashover*	140 KV
Dry Arcing Distance	5"
Leakage Distance	9"
Rec. pin height	5"
Cantilever Strength	3000 lbs.
Low Freq. Puncture Voltage	95 KV
RNI (plain)	5500 microvolts
RNI (radio-freed)	50 microvolts
1000 KC at applied KV	10 KV

*Crest KV. 1½ x 40 microsecond wave Critical Value

For the full facts on Victor "Know-how", write for "The Story of Victor and Purified Porcelain." For engineering data on Victor Insulators, write for Bulletin No. 4.

NEWS FROM VICTOR

Shown in the drawing above are the control panel and Oscillograph for the impulse generator in the Victor electrical laboratory. This equipment is being used to study the effects of high surge voltages on both present and projected insulator designs.

SPECIFY VICTOR

Purified Porcelain Pintypes

VICTOR INSULATORS DIVISION
I-T-E CIRCUIT BREAKER CO.
VICTOR, N. Y.

Low and High Voltage Pintypes • Suspensions • Guy Strains
Spools • Switch and Bus Insulators • Custom Designed Porcelain Insulator Hardware

Why Pay 3 MEN to Watch Your Line Crew Work?

START SAVING TIME and MONEY with

TEL-E-LECT 2-MAN UTILITY RIGS

If you're using 5-man crews and old fashioned utility equipment (even on '55 chassis) you've got *three extra men on most jobs!*

With Tel-E-Lect equipped trucks you'll discover the great time and money saving advantages of 2-man construction trucks. Leading public utility companies throughout the country are now using 2-man trucks to do a large share of the work once performed by 5-man crews—and they're realizing increased profits in the process.

Your 2-man crew won't work any harder, but they'll produce more and do it faster than many 5-man crews. You see, Tel-E-Lect builds the services of three men into its utility truck equipment. Tel-E-Lect equipment provides new power features that require only two men to perform the tasks once done by five!

The 2-man construction equipment described here lets you put smaller crews on everyday jobs while freeing big crews and big equipment for the really tough highline jobs.

THE TEL-E-LECT COMBINATION BODY

This *complete* package consists of a rugged steel body, stowaway derrick, winch and drive, pole hole digger and drive and rapid forward-reverse transmission. Three simple installation steps by your local mechanic puts the Combination Body on your truck chassis regardless of make or model. You simply install power take-off . . . mount body and connect power drive . . . and install cab controls. It's now ready to go to work!

A Tel-E-Lect all steel Combination Body is completely equipped with Stowaway derrick, digger and power units—a model 2-man construction truck.

Front mounted Tel-E-Lect "T" frame derrick and Tel-E-Lect Pole Hole Digger gives this utility truck 2-man versatility.

WINCH, DIGGER AND DRIVE KITS FOR ALL POPULAR-MAKE TRUCKS

A series of easily installed Tel-E-Lect kits make it possible to install derricks, diggers and power drives at the front of your present utility truck. The flexibility and economy of 2-man operation can be extended to any size or model of International 4x4, Ford, Chevrolet, GMC, Dodge or other truck.

These Tel-E-Lect kits are designed specifically for the particular truck on which they will be installed. Each kit contains every part needed for easy installation by your local mechanic.

TEL-E-LECT SELF-STORING DERRICK CONVERSION KITS

An entirely new concept of derrick storage eliminates the hazards once involved in derrick erection and take-down. Your front mounted "A" or "T" frame derrick stores on top of the truck—doesn't use valuable body space for storage.

Your truck's winch supplies power to raise or lower derrick. With a double drum winch you'll get "live-boom" flexibility and with a single drum winch you'll get easily adjustable derrick elevation! This low cost unit fits any truck with or without body and is quickly installed.

This 2-man construction truck features a front mounted Tel-E-Lect T-45 derrick and Tel-E-Lect Self Storing Derrick Conversion. The derrick is shown in its stored position in the smaller photo.

Tel-E-Lect provides other kits for individual requirements. Write us about any of your utility truck problems.

TELE-LECT PRODUCTS, INC.

TEL-E-LECT PRODUCTS, INC.

10,003 Minnetonka Blvd., Minneapolis 16, Minnesota

New Equipment

(*Continued from page* 188)

normally used. Maintenance is simplified by visual inspection of print board panels for circuit faults.

The control is available in two ratings, ¾ to 1 hp, and 1½ to 3 hp, full wave. Other drives, with conventional circuitry, are available in full- or half-wave models in ratings up to 30 hp.

General Electric Co, Schenectady 5, N. Y.

Small Switches

A series of rotary motor-reversing switches can control single-phase motors up to 2 hp. Diamond-H switches are designed for use with fans, grinders, pipe threading machines, and home workshop equipment. The switches measure less than 2 x 2 x ⅞ in., but carry ratings of ½ to 1 hp, 120 v, and up to 2 hp and 20 amp, 240 v, ac.

Hart Mfg Co, 110 Bartholomew Ave, Hartford, Conn.

Two-Way Radio

Mobile radio eliminates need for heavy duty generators and associated equipment in vehicle installations. Designed to operate in 450-460 and 460-470 mc bands, it is said to offer exceptional voice quality and clarity through true FM transmission and reception. A new circuit design reduces cost of maintenance and replacement parts since the system requires practically no high cost tubes, cavities or other parts.

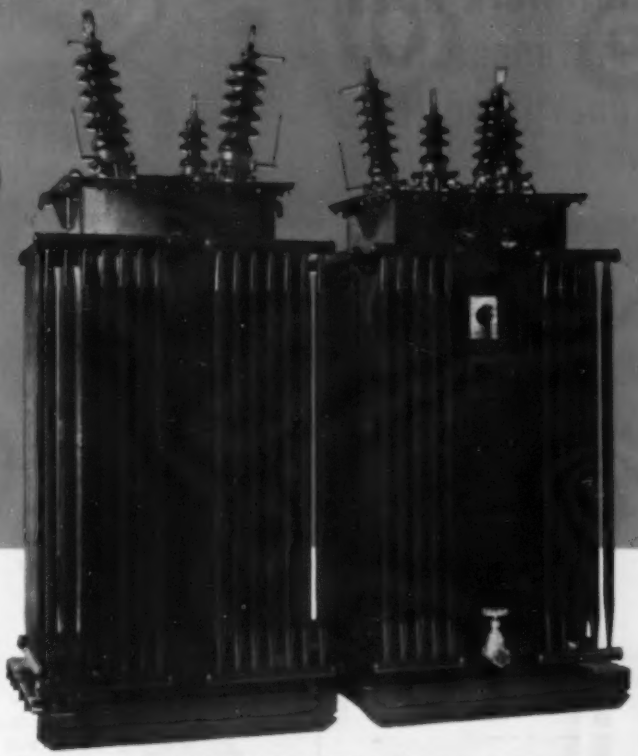
A 4.5 w model is available for under dash or trunk mounting. Plug-in power supplies are interchangeable in units for 6, 12, and 32 v operation. The 25-30 w model operates on 6

(*Continued on page* 192)

UPTEGRAFF DISTRIBUTION TRANSFORMERS

SEALED TANK CONSTRUCTION

means longer-life low maintenance



Tight sealing that prevents "breathing" and the entrance of moisture, prolongs the service life of Uptegraff Transformers. Oxygen and moisture are found to be the principal causes of oil deterioration. All flanges and openings are so effectively sealed, that even the keen perception of the super-sensitive electronic Leak Detector does not find any sign of leakage.

This is only one of many features that give Uptegraff Transformers exceptionally long life expectancy, and reduce maintenance costs.

Uptegraff makes distribution transformers in all commercial ratings, from 3 KVA to 500 KVA, and in a complete series of dry type air-cooled designs, as well as the liquid-filled units.

Every liquid-filled Uptegraff Distribution Transformer is checked by the electronic Leak Detector before shipment. The photograph above shows front and rear views of a single phase, 60-cycle, 26,400-13,100Y/7560 volts, 500 KVA transformer.

R. E. UPTEGRAFF MANUFACTURING COMPANY

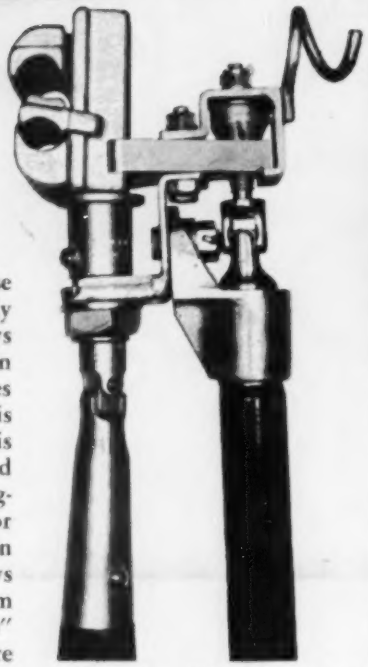
Scottdale, Pennsylvania

SAFETY LIVE LINE TOOLS

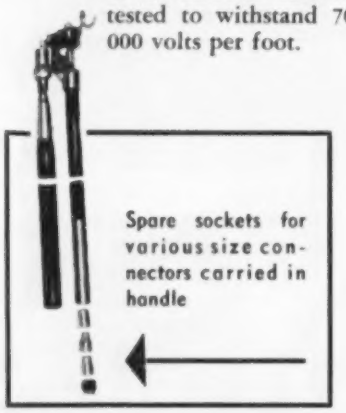
SAVE ON MANPOWER!

CONNECTOR TOOL for work at safe distances from energized lines

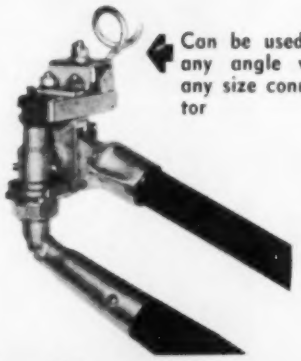
Tool places and removes Fargo vise type connectors of any size quickly and safely. Connector is set in jaws of tool so that head of bolt fits in socket. Twisting handle forces jaws together and connector is gripped tightly. Connector tool is set over line and jumper wire and is held in place by wire clamp. Toggle handle is turned until connector closes. Turning gripping handle in opposite direction releases jaws permitting removal of tool from line. Tool is available with 6'6" or 8' handles that are tested to withstand 70,000 volts per foot.



Holding Fargo connector for 397,500 cm cable



Spare sockets for various size connectors carried in handle



Can be used at any angle with any size connector

Write for catalog #8
illustrating and describing this tool
and over 100 other live line tools

SAFE-WAY TOOLS

SAFETY LIVE LINE TOOL CO.
973 - 86TH AVE. • OAKLAND 21, CALIF.
Est. 1926 by Chester C. Coon

New Equipment

(*Continued from page* 190)

and 12 v. Transmitters and receivers are separate plug-in units and can be removed quickly for servicing.
Connecticut Telephone & Electric Corp, Meriden, Conn.

Trench Digger

Hydraulically-operated backhoe converts crawler tractor into a digger for tight-spot trenching and digging operations. The unit can also be used for backfilling and rough grading. The Agrihoe has a 10-ft reach, can dig to a 6-ft depth, and load to an 8-ft height. Buckets are interchangeable in 9 or 12 in. widths.

Agricat tractors are 58 in. long, 38 in. wide, and 41 in. high.
Earl H. Pence Co. Inc, 2150 Washington Ave, San Leandro, Calif.

Automatic Control

An "electronic supervisor" follows preset programs and automatically switches on or off up to 40 groups of remote operations, each on its own time schedule. The Central Control System uses carrier current signals and operates over existing electrical circuits. It does not require the installation of a single transmission wire. "Command" signals or pulses are superimposed on existing circuits and in no way interfere with regular electrical functions.

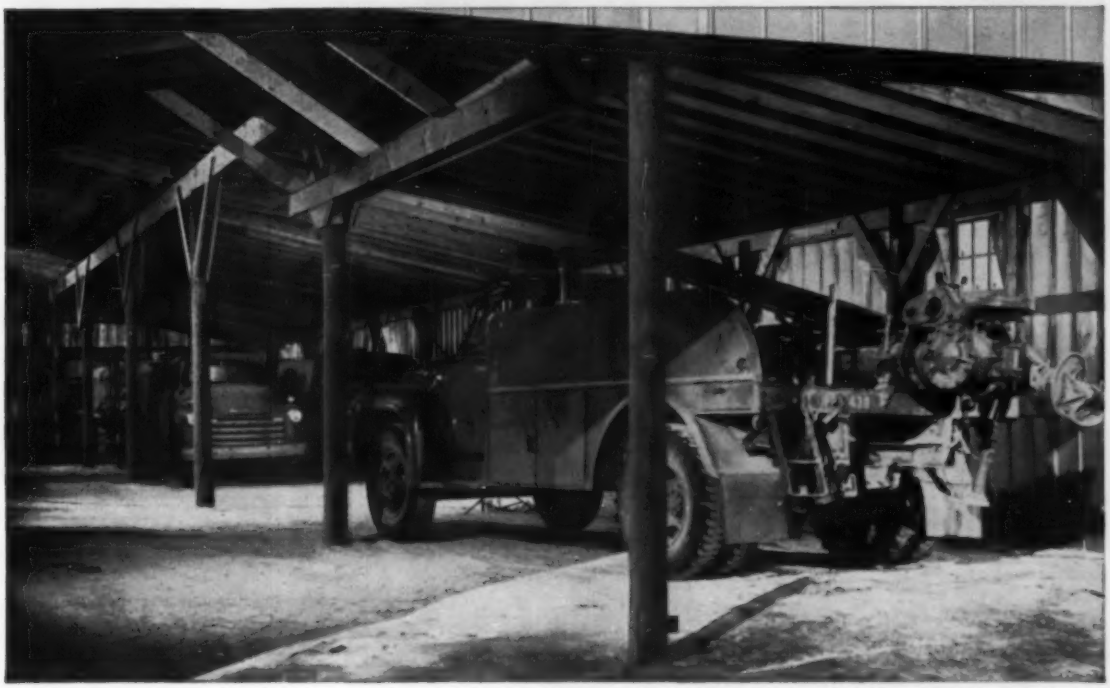
Basic components of the system are its central operations panel, transmitter, and coded relays. The central operations panel is the source of the system's directions or "commands." Through its relays and an electronic

(*Continued on page* 194)

DOW

NOW *PENTA*–TREATED POLES

give you permanent buildings for equipment storage and other uses at half usual construction costs



THE DOW CHEMICAL COMPANY
Dept. PE 845A, Midland, Michigan

☐ Send me additional information on pole-frame buildings.

☐ Send me more information on PENTA-treated poles and crossarms.

☐ Send me a list of PENTA-treating plants.

Name_____

Title_____

Company_____

Address_____

City_____ Zone_____ State_____

The same clean PENTA*-treated poles, which have served you year after year in your lines, now can be put to a profitable *new* use. PENTA-treated poles give decay-free permanence to the pole-frame structures that are going up all around the country. The great popularity of these pole buildings is obvious: they can be built for *half the cost* of conventional structures.

Pole structures bring you garaging, storage, repair areas of almost unlimited flexibility. You can plan and build for *function* and *economy* to a degree impossible with more costly construction.

Over 100 suppliers provide utilities with PENTA-treated poles closely checked for long life. Ask *your* regular supplier about the benefits of *PENTAchlorophenol preservative. And for more information on low-cost pole-frame buildings mail coupon to THE DOW CHEMICAL COMPANY, Midland, Michigan.

you can depend on DOW CHEMICALS DOW

Here's how you can enjoy extra profit dollars with

YORK-HOOVER
Model 4986
SERVICE BODIES

THE MODEL 4986 SERVICE BODY is an especially well-designed service and repair body, engineered to be installed on a standard ¾ to 1 ton chassis.

THE PRIMARY PURPOSE of the Model 4986 Service Body is to speed up maintenance and repair work by contributing an orderly method of carrying necessary tools and materials.

STURDY, ALL-METAL CONSTRUCTION provides rugged durability—a factor that enables the Model 4986 Body to "take it" for everyday service work.

COST-SAVING EFFICIENCY is the end result . . . the reason why for over 60 years York-Hoover Equipment has maintained a high record of performance, low operating and maintenance costs.

Get the facts! Write for a FREE copy of Bulletin No. 934 today.

YORK-HOOVER
PUBLIC UTILITY BODIES

YORK-HOOVER CORPORATION
BODY DIVISION
YORK, PENNSYLVANIA

New Equipment

(*Continued from page* 192)

transmitter, pulses are sent to coded relays for operation of electrical services, with the coded relays rejecting all pulses other than those to which they are preset to respond. The system may be expanded quickly and easily at any time, if desired.

International Business Machines Corp, 590 Madison Ave, New York 22, N. Y.

Small Motors

Redesigned small fractional hp single-phase motors have shallower endplates to reduce their length. Ample ventilating openings are located below centerline for effective dripproof construction. There are no ventilating openings in the rolled steel frame. Quick-break switch and thermal overload protector are attached to terminal board mounted inside stator frame.

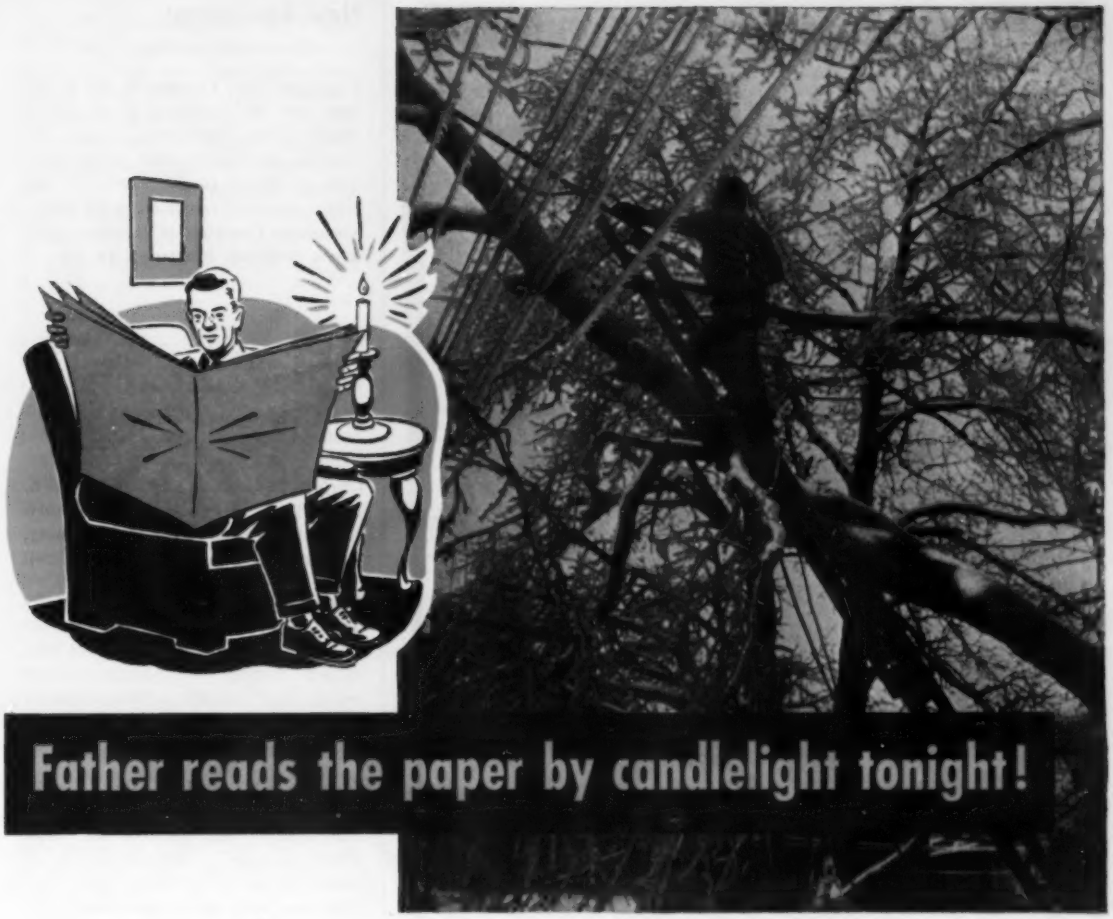
Motors are available with either sleeve or ball bearings and rigid or resilient bases. Ratings are ¼ hp and smaller. Ask for Bulletin MU-200. **Wagner Electric Corp, 6400 Plymouth Ave, St. Louis 14, Mo.**

Joint Compound

Electrical joint compound dissolves thin aluminum oxide films without attacking metallic aluminum and prevents reforming of oxide film within the range of normal conductor temperatures. It is a grease-type compound which is insoluble in water, has a flow point of approximately 150F, and has no tendency to harden other than natural aging.

Comparative tests are said to reveal that joints made with Alcoa No. 2

(*Continued on page* 196)



Father reads the paper by candlelight tonight!

Reading the evening paper by candlelight is no joke. When bad weather brings down distribution lines, customers' blood pressures go up and loads drop. Public relations programs suffer correspondingly.

That's why weatherproof line wires in utility distribution systems are being replaced by messenger-supported, insulated aerial cables. These cables will operate safely and dependably even with broken poles.

Simplex Aerial Cables use Anhydrex insulation for long-lived physical properties, and for mechanical and electrical stability in water. Simplex-compounded neoprene provides a lightweight, tough jacket that withstands prodigious punishment.

To minimize the chance that father will read his paper by candlelight tonight, or any night, investigate messenger-supported, Anhydrex-insulated, Simplex Aerial Cables. Write today to the address below for Catalog No. 1006.

Simplex WIRE & CABLE CO.

79 Sidney Street, Cambridge 39, Massachusetts

THESE GREASED GRIPPING CHUCKS

HOLD

STEEL STRAND AND ACSR
IN RELIABLE SPLICES AND DEADENDS

Single jaw for
⅜" steel strand
has 165 teeth.
Cutaway showing complete gripping chuck assembly.
Here's how floating jaws surround and HOLD conductor.
Single jaw showing two-level design for ACSR.

Extensive research has shown the way to make self-acting splices and deadends to HOLD even steel strand. These same basic principles are now applied to all other Reliable gripping chucks made to HOLD ACSR, copper and aluminum.

Look at the illustration of the jaw for ⅜" steel strand. Note the number of sharp teeth. This size chuck has 495 individual teeth that engage the wire instantaneously and HOLD permanently. Made in six sizes for No. 8 wire to 7/16" strand. They even HOLD such high tensile steels as are used in prestressed concrete construction (260,000 to 290,000 P.S.I.)

The second jaw above is for No. 2 ACSR and features the two-level design that permits the steel core and the aluminum conductor to be gripped and HELD by the same chuck. In this size a total of 84 individual teeth grip the steel core and 396 more surround and HOLD the aluminum strands.

The gripping chucks, used in Reliable splices and deadends, are designed and made to HOLD permanently. Tension applied momentarily, during installation, assures an electrical joint that is of less resistance than the conductor.

A momentary tension of about 15% of rated wire strength is enough to produce and maintain this low resistance joint.

Reliable ELECTRIC COMPANY 3143 Carroll Avenue Chicago 12, Ill.

Over 45 years service to the utilities

POWER LINE CONNECTORS AND CONSTRUCTION SPECIALTIES

New Equipment

(*Continued from page* 194)

Electrical Joint Compound are in the same low resistance range as silver-plated joints. Although it was developed for bolted bus joints, tests indicate that it is also applicable for bolted electrical connections for cable. **Aluminum Company of America, 1501 Alcoa Building, Pittsburgh 19, Pa.**

MORE NEW PRODUCTS

about which you should know

Curtis Machine Corp, Jamestown, N. Y., has a small conveyorized bench type all purpose **grinding, polishing, and deburring machine** (Model 304).

Hobart Brothers Co, Hobart Square, Troy, N. Y., offers a 300-amp dc selenium rectifier type **arc welder** with remote control. A 5-range control switch and remote control rheostat provide a welding current range of 35 to 45 amps.

Murphy & Miller, Inc, 1326 S. Michigan Ave, Chicago, Ill., introduced a mechanically refrigerated **air drier** which produces a constant supply of clean, dry air to -110 deg. dew point. The automatic unit is available in capacities of 4 cfm and higher.

Beckman & Whitley Inc, 912 E. San Carlos Ave, San Carlos, Calif., has **explosive disconnect** for as many as 100 circuits on a non-shorting basis. For use with body of standard plug and receptacle.

Metron Instrument Co, 432 Lincoln St, Denver 3, Colo., has multi-range **tachometers** with new linear circuits for longer life . . . Thompson Elevator Co, 2756 W. Superior St, Chicago, Ill., has **elevator overloading device** which signals when predetermined load is reached and prevents movement of elevator when overloaded.

Electric Soldering Iron Co, Inc, Deep River, Conn., offers a **soldering iron** with a lightweight Luger grip and fast-heating tip in dual or single heat models . . . Eagle Electric Mfg. Co, Inc, 23-10 Bridge Plaza South, Long Island City 1, N. Y., has an all rubber **weatherproof socket** rated 660 w, 600 v made with No. 14 Type R wire.

Vacuum Specialties, Inc, 77 Prospect St, Somerville, Mass., manufactures an automatic high speed **production lamp coater.** The unit produces reflective vacuum evaporated silver or aluminum coatings . . . Multi-Matic Corp, 14741 Bessemer St, Van Nuys, Calif., offers ac and dc portable **electric power plants.** The Gen-A-Matic line includes 22 models with ratings from 275 and 500 w, 6 and 12 v to 4,000 w, 120 v.

General Electric Co, Schenectady 5, N. Y., has:
General purpose **ac welder** covering a current range of 25 to 295 amp for job shops and light industrial applications. Type WK29A has a 50% duty cycle in normal welding range of 200 amp.
Low-hydrogen **welding electrode** with powered metal added to the coating for fast and easy operation. Strikeasy LH-1 is usable on alloy and mild steels.

Minnesota Mining & Mfg. Co, Dept. E5-33, St. Paul, Minn., offers improved thermosetting **paper tape** with pressure-sensitive adhesive that sticks tight on contact with 50% more "grab" than its predecessor. Electrical Tape No. 39 is for holding and insulating in the manufacture and repair of electric motors, coils, transformers, and generators.

Minneapolis-Honeywell Regulator Co, Wayne & Windrim Ave., Philadelphia 44, Pa., has **millivoltmeter controller** housed in a horizontal case. The plug-in unit is available in on-off, two-position, and three-position control forms. Three-position control has a dual index and provides a neutral zone adjustable from 0 to 100% of full scale (wide zone model) or 0 to 10% of full scale (narrow zone model). Calibrated accuracy is 0.75% of full scale.

Hart Mfg. Co, 110 Bartholomew Ave, Hartford, Conn., offers a series of **small rotary switches** with dual coaxial spindles to provide simplified control of a second switch, thermostat, solenoid, damper, valve or other electrical or mechanical unit. Model 3900 switches have ac ratings up to 20 amp at 120 or 240 v; ½, ¾, and 1 hp at 120 v; and 2 hp at 240 v. They are available single or double pole, two to 12 positions, with stop as required.

THESE GREASED GRIPPING CHUCKS

HOLD

COPPER AND ALUMINUM CONDUCTOR IN RELIABLE SPLICES AND DEADENDS

Literally hundreds of teeth grip and HOLD the copper conductor.
Conductor is almost completely surrounded by the Reliable gripping chuck assuring an overall permanent grip.
Jaw used in Reliable deadends to HOLD aluminum strand or solid wire.

In developing gripping chuck jaws that HOLD high tensile steel strand, Reliable researchers developed new jaw designs that grip and HOLD permanently not only steel strand and ACSR, but also copper and aluminum. These designs are now used in all Reliable splice and deadend gripping chucks.

On each copper gripping chuck jaw for 2/0 copper conductor, there are 126 cold-forged engaging teeth or a total of 378 individual HOLDING points in each three-jaw chuck. The teeth, the chucks and the precision tapered cases are scientifically designed and precision made to HOLD permanently.

The aluminum jaw illustrated above is for No. 2-7 str. aluminum. The three-jaw gripping chuck is provided with 315 individual, keen-edged teeth that grip the strand instantaneously and HOLD permanently without damage to the strands.

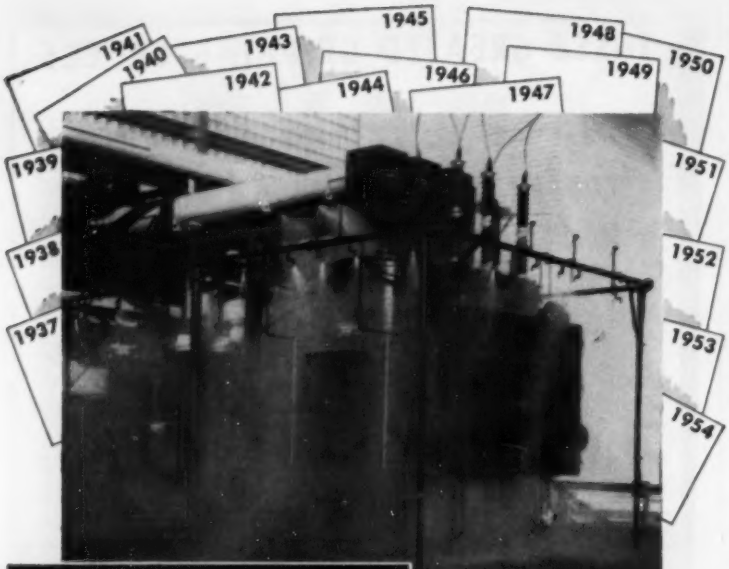
A tight, low-resistance electrical joint is assured with Reliable splices when momentary tension is applied at time of installation. Reliable splices properly installed will actually run cooler than the conductors.

A momentary tension of about 15% of rated wire strength is enough to produce and maintain this low resistance joint.

Reliable ELECTRIC COMPANY 3145 Carroll Avenue Chicago 12, Ill.

Over 45 years service to the utilities

POWER LINE CONNECTORS AND CONSTRUCTION SPECIALTIES



18 years and 28 installations ago...
at Philadelphia Electric Company

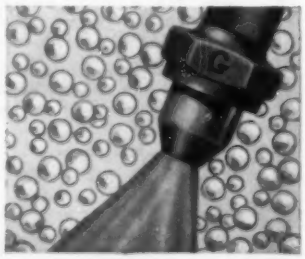
Mulsifyre installation protecting a 105 MVA transformer at the newly completed, modern Cromby Station of Philadelphia Electric Company, Phoenixville, Pa.

It was back in 1937 that Philadelphia Electric Company installed its *first* Grinnell system of Mulsifyre Protection.

The record achieved in the intervening years speaks for itself . . .

During the past 18 years, Philadelphia Electric Company has authorized Mulsifyre Protection for 28 different stations and sub-stations in its far-flung operation. This "repeat business", from a single user, is evidence of unsurpassed performance.

If *your* transformers are not protected by this effective emulsion-forming spray system, don't take chances. Get quick-acting Grinnell Mulsifyre. Complete extinguishment of fires within areas protected with Grinnell Mulsifyre sprays usually is obtained in a matter of seconds after the water discharge starts. For full details, write Grinnell Company, Inc., Providence, R. I. Offices in principal cities.



GRINNELL *Mulsifyre*

EMULSION-EXTINGUISHMENT OF OIL FIRES

CATALOGS · BULLETINS

● **CASTING RESIN:** Technical Bulletin No. 7-2-5 describes properties and gives instructions on the use of Stycast 2340M, a two part casting resin. Emerson & Cuming, 869 Washington St, Canton, Mass.

● **TRANSFORMERS:** Booklet B-6403 discusses and illustrates features of 3 to 167 kva, pole type, distribution transformers. Information includes corrosion resistance, sealing, installation, operation, and maintenance. Westinghouse Electric Corp, Box 2099, Pittsburgh 30, Pa.

● **GE BULLETINS:** The following bulletins containing ratings, catalog numbers, dimensions, and specifications are available from Advertising & Sales Promotion, Distribution Assemblies Dept, General Electric Co, Plainville, Conn.:

GEA-6168, Stage Lighting Switchboards; GEC-1257, Type NLTQ Lighting Panelboards; GEC-1239, Type NLAB Lighting Panelboards; GEC-1240, Type NAB Lighting Panelboards; BEC-1249, Types NTP and NTC Lighting Panelboards; GEC-1254, Types NLTQX Lighting Panelboards; GEC-1252, Type NCB Convertible Circuit Breaker Distribution Panelboards; GEC-1255, Type CCB Convertible Circuit Breaker Distribution Panelboards; GEC-1256, Swing-Wa Distribution Panelboards; GEC-1253, Converti-Fuse Type Distribution Panelboards.

● **LINE HARDWARE:** Supplementary pages (14) are available for Hi-Line Hardware catalog which contains blueprints and specifications for a line of drop-forged steel and aluminum high-voltage transmission line hardware. Complete catalogs are also available. Brewer-Titchener Corp, Cortland, N. Y.

● **TELEVISION:** Catalog E.51, 4-pages, gives features, specifications, and applications of industrial television equipment. Radio Corporation of America, Engineering Products Div, Building 15-1, Camden 2, N. J.

● **SOUND EQUIPMENT:** A catalog entitled "Jobber Sound Products" describes a line of microphones, amplifiers, and loudspeakers for specific applications and uses in the field of commercial electronics. Altec Lansing Corp, 161 Sixth Ave, New York 13, N. Y.

● **SMALL MOTORS:** Catalog F 4344-1 describes permanent magnet dc motors with outputs up to 1/10 hp. Data sheets on typical motors from 6 to 115 v and descriptions of units having radio noise filters, gear heads, and centrifugal blowers are included. Barber-Colman Co, Aircraft Controls Div, Rockford, Ill.

● **GEARS:** A 6-page brochure entitled "Geartronics" describes the use of true precision gears used under conditions of exceedingly high speeds or extreme temperatures. Technical Products Co, Inc, West Concord, Mass.

● **PANELBOARDS:** Bulletin No. 501, 24-pages, illustrates and describes a complete line of lighting and distribution panelboards. Ratings, weights, dimensions, and knockout arrangements are given along with federal specifications as they relate to circuit breaker and fusible type panelboards. Continental Equipment Co, Box 1055, Cincinnati 1, Ohio

● **CONNECTORS:** A 10-section catalog lists power connectors for use with aluminum and copper conductors. Included is an extensive data section to assist in estimating, planning and engineering the use of connectors for tubing, cable, and busbar connection combinations. Delta-Star Electric Division, H. K. Porter Co, Inc, 2437 Fulton St, Chicago 12, Ill.

● **GROUNDING SWITCH:** Bulletin 54 HR, 4-pages, gives applications, ratings, construction features, and dimensions for Type HR automatic, high speed, short circuiting switches with ratings from 34.5 to 161 kv. Bulletin 54 SU, 4-pages, describes complete services available for design, engineering, production, and construction of substations. Southern States Equipment Corp, Hampton, Ga.

● **TEMPERATURE DETECTORS:** Data sheet N-83(1) describes radiation-type temperature detectors. Specifications, types, and mountings are covered for direct sighting applications to measure temperature of stationary or moving surfaces and for sighting into closed-end target tubes to measure temperature of furnace atmosphere or other medium. Leeds & Northrup Co, 4934 Stenton Ave, Philadelphia 44, Pa.

● **THERMOCOUPLE TESTER:** A 12-page brochure describes the "Jetcal" jet engine temperature system tester which checks accuracy of thermocouple systems right on the aircraft or on engine production lines. Also described are probes for checking thermal switches of overheat detectors and cylinder head thermocouples. B & H Instrument Co, Inc, 1009 Norwood, Fort Worth 7, Texas

● **INSTRUMENTS:** Three bulletins describe the Type 1570-A Automatic Line-Voltage Regulator for loads up to 6 kva, Variac Motor Speed Controls in 1/15 to 1-½ hp models, and the Type 1862-B Megohmmeter for checking insulation resistance up to 2,000,000 megohms. General Radio Co, 275 Massachusetts Ave, Cambridge 39, Mass.

● **MOTORS:** An 8-page booklet, 1878, contains pictures and descriptions of 20 types of motors. Details of transverse bearing lubrication, asbestos-protected windings, and normalized motor castings are given. U. S. Electrical Motors Inc, Box 2058, Los Angeles 54, Calif.

● **RELAYS:** A 1-page bulletin, No. 553, shows how to select magnetically or mechanically held relays. Circuit diagrams are included for both types of relays. Automatic Switch Co, 391 Lakeside Ave, Orange, N. J.

● **TRANSFORMERS:** Bulletin H-305A, 27-pages, describes design features, construction, assembly and testing of single-phase distribution transformers up to 167 kva, 15 kv. Voltage ratings, taps and dimensions for conventional, CSP, and rural type transformers are also given. Maloney Electric Co, St. Louis 20, Mo.

● **EPOXY RESINS:** A 16-page booklet entitled "Bakelite C-8 Epoxy Resins and Hardeners" describes their use in various applications. Data on storage life and handling of resin compounds, their working life, mixing, fillers and cleaning equipment are explained in a section on compounding. Bakelite Co, 300 Madison Ave, New York 17, N. Y.

● **INSULATION:** A 22-page catalog contains descriptive information, photos, prices, and ordering data for electrical insulating materials. Publications Dept, Insulation Mfrs. Corp, 565 West Washington Blvd, Chicago 6, Ill.

● **METERS:** Booklet CP-1025 uses a three-dimensional representation to explain design factors of single-phase Lifetime meter which provides increased reserve capacity, thermal capacity, insulation level, stability, corrosion protection, and operating range. Westinghouse Electric Corp, Box 2099, Pittsburgh 30, Pa.

● **BLOWERS:** Bulletin BC-11 gives dimensions, specifications, and performance data on non-overloading utility blowers. Hartzell Propeller Fan Co, Piqua, Ohio.

(More Catalogs & Bulletins on page 201)

Linemen call this hoist a "HONEY"

Designed especially for line work, this NEW CHANCE HOIST has all the features linemen want!

Here's what makes this ONE-TON HOIST the linemen's favorite:

- Well-balanced, easy-to-grip handle that operates from either side to avoid obstructions.
- "Free-wheeling" for ease in hooking to load, with an automatic locking control to prevent accidental dropping of load.
- Both half link and full link take-up for accuracy and speed.
- Easy working swivel hooks on both the chain and the hoist housing. Safety latch hooks, if desired, at slight additional cost.
- All working joints fitted with permanently lubricated oilite bearings.
- All working parts fully enclosed in the housing to prevent injury to fingers.

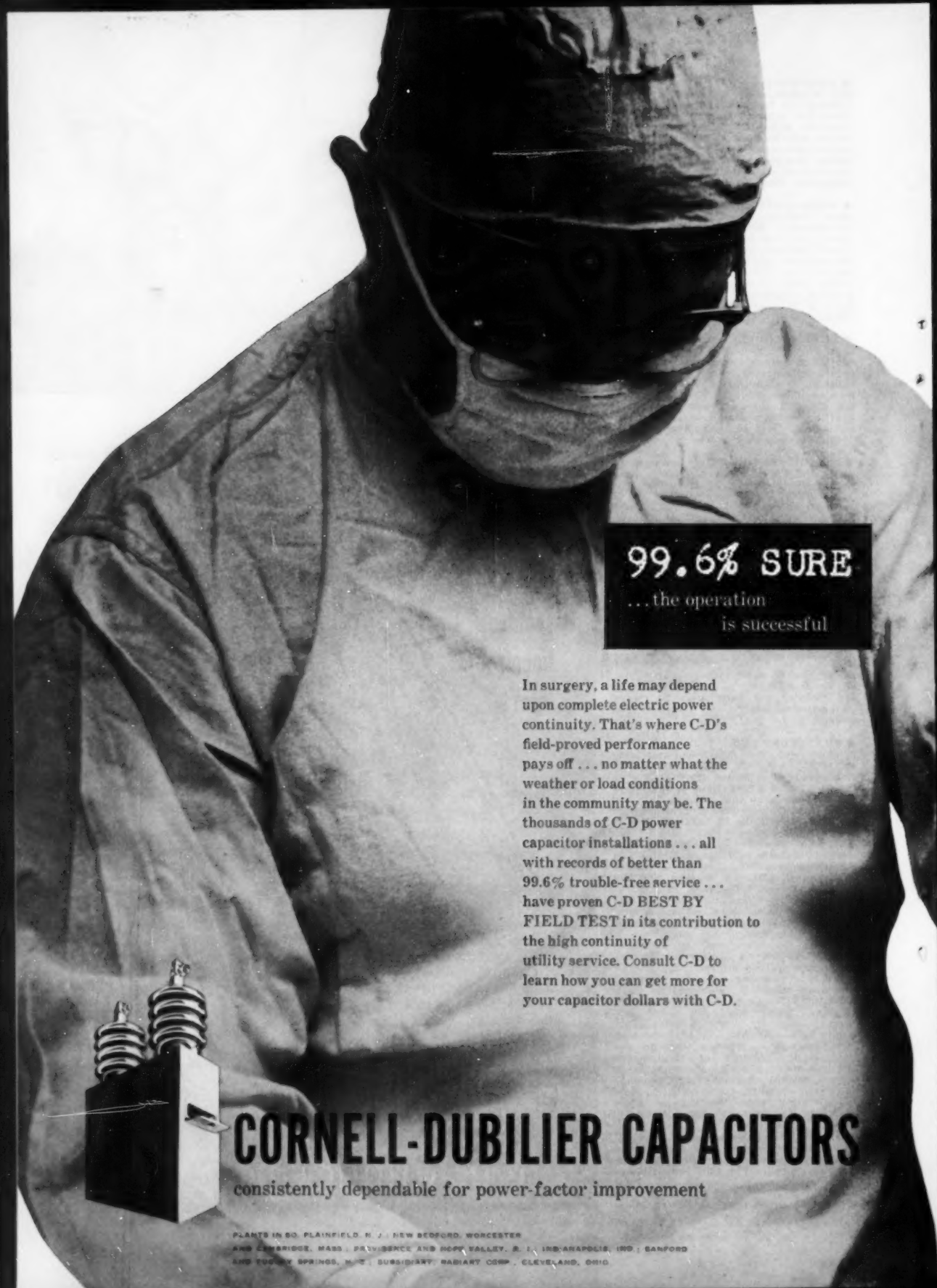
Here's the tool your linemen asked for in a nationwide field survey—a tool developed by Chance engineers, who *know* line work. It has all the good features linemen said they wanted in a hoist. It's a strong, fast-operating, lightweight tool (12 pounds) with a flexible steel load chain that won't kink, bind or uncouple. Controls can be worked without removing gloves. It's rated to lift a one-ton load and it's tested to 3000 pounds. Give your lineman the extra help and safety that the Chance Hoist can provide.

C754-9

A·B·CHANCE CO·

CENTRALIA, MISSOURI • SAN FRANCISCO, CALIFORNIA

ABC


99.6% SURE
...the operation is successful
In surgery, a life may depend upon complete electric power continuity. That's where C-D's field-proved performance pays off . . . no matter what the weather or load conditions in the community may be. The thousands of C-D power capacitor installations . . . all with records of better than 99.6% trouble-free service . . . have proven C-D BEST BY FIELD TEST in its contribution to the high continuity of utility service. Consult C-D to learn how you can get more for your capacitor dollars with C-D.
CORNELL-DUBILIER CAPACITORS
consistently dependable for power-factor improvement
PLANTS IN SO. PLAINFIELD, N. J.; NEW BEDFORD, WORCESTER AND CAMBRIDGE, MASS.; PROVIDENCE AND HOPE VALLEY, R. I.; INDIANAPOLIS, IND.; SANFORD AND TUCKER SPRINGS, N. C.; SUBSIDIARY, RADIART CORP., CLEVELAND, OHIO

CORNELL-DUBILIER
power-factor capacitors
give you better than 99.6%
trouble-free service*

Low dielectric unit stress provides an extra margin of safety that results in the ability to withstand higher transient voltages. When you buy C-D, you buy premium quality at no extra cost.

C-D capacitors are impregnated and filled, in hermetically sealed containers with non-inflammable, non-explosive Dykanol. In addition, C-D's conservative engineering and design makes possible the use of special impregnants to fulfill even the most exacting requirements for sub-zero switching operations.

Extra strength wet process two piece porcelain terminals . . . one of the many important reasons why C-D capacitors can point to year after year of trouble-free service in coastal areas.

Another evidence of C-D's premium quality power capacitor service . . . at no extra cost . . . is the fact that C-D has *no* "Return Material Department". Most repairs are of such a minor nature that they are handled on an individual basis. This results in a prompt, personalized service impossible where the safety factor has been cut in favor of production, weight and size economies.

Why is it that only C-D power capacitors give you assurance of complete dependability?... because C-D's built-in safety factor results from the ultimate in tried and proven design levels coupled with conservative production techniques and rigorous quality control. For catalog write to Cornell-Dubilier Electric Corporation, South Plainfield, N. J.

This pole-mounted C-D Capacitor installation has been on the job for an Eastern utility since 1939 with little or no maintenance.

*This is an average based on reports from leading utilities using C-D capacitors. Many of these reports have shown 100% trouble-free service, and none lower than 98.8%.

Catalogs

(*Continued from page* 199)

● **SOLENOIDS:** Bulletin GEA-6215, 16-pages, contains information on product features, laboratory tests, and general application rules for a new line of solenoids. A cross-reference chart equates this line with corresponding models in a former line, and shows the proper model to be chosen for given requirements of force and stroke. Force and current curves, and dimensions for both push and pull types are included. General Electric Co, 1 River Rd, Schenectady 5, N. Y.

● **MOTORS:** A booklet entitled "Check the Facts" points out 100 characteristics of a line of totally-protected ac motors. Included are facts about fan-cooled, corrosion-proof, and explosion-proof designs. Reliance Electric & Engineering Co, 1088 Ivanhoe Rd, Cleveland 10, Ohio

● **EARTH BORER:** Bulletin No. 4401-M, 4-pages, describes construction and operation of portable mechanical earth borer. J. H. Holan Corp, 4100 W. 150 St, Cleveland 11, Ohio

● **SNAP-ACTION SWITCHES:** Catalog No. 62, 28-pages, gives dimensioned drawings, terminal variations, ratings, and technical information on over 400 phenolic enclosed, precision snap-action basic switches. Micro Switch, Freeport, Ill.

● **CABLE CLAMPS:** A 1-page bulletin describes a line of cross tap clamps for cable sizes from No. 6 to 1000 MCM. Aluminum fittings, high pressure connections for copper, general purpose connectors, terminal lugs, and grounding devices are also illustrated. Jasper Blackburn Corp, 35 Madison St, St. Louis 6, Mo.

● **LAMINATIONS:** Bulletin L-155 gives dimensions, weights, and prices of a series of EI type laminations for 3φ, 60 cycle transformers. Thomas & Skinner Steel Products Co, Inc, 1155 E. 23rd St, Indianapolis, Ind.

● **METER MOUNTS:** An 80-page catalog gives descriptions, dimensions, and applications of meter mountings along with descriptions and ratings of meter testing and service equipment. Anchor Mfg. Co, Manchester, N. H.

● **BRAKE MOTOR:** A 1-page leaflet, Form PM4-254, contains dimensioned outline drawings and full standard application specifications for a small 28-v dc motor recommended for continuous-duty applications requiring high torque and good speed regulation together with a built-in magnetic brake. Dalmotor Co, 1389 Clay St, Santa Clara, Calif.

● **ELECTRIC TRUCKS:** A 24-page catalog illustrates and describes a line of battery-powered industrial electric trucks. The Raymond Corp, 144-131 Madison St, Greene, N. Y.

● **TECHNICAL CHARTS:** A 12-page catalog outlines services available for producing recording charts for standard and special instruments. Technical information is given on requirements for special charts and samples of both dial and roll type charts are included. Technical Charts, Inc, 189 Van Rensselaer St, Buffalo 10, N. Y.

● **SUBMINIATURE SWITCHES:** Catalog No. 75, 12-pages, gives descriptions, dimensions, and ratings of subminiature snap-action precision switches, auxiliary actuators, subminiature switches, toggle, and push button subminiature switch assemblies. Micro Switch, Freeport, Ill.

● **LIMIT SWITCH:** A technical brochure details applications and construction features of rotary limit switches. Specifications, prices, and installation dimensions are also given. Gemco Electric Co, 25641 W. Eight Mile Rd, Detroit 19, Mich.

PAGE chain link FENCE

America's First Wire Fence—since 1883

• When next you need fence as protection against common hazards you certainly will want time-tested quality in the safeguard you provide. Whether you choose heavily galvanized Copper-Bearing Steel, corrosion-resisting Aluminum, or long-lasting Stainless Steel, PAGE Fence is quality controlled from raw metal to rugged fence erected on metal posts deep-set in concrete. Available are 8 basic styles, varied by heights, types of gates, top rails, and barbed wire strands for added security. Finally, your PAGE Fence will be expertly erected by a reliable, technically trained firm. For important fence data and name of nearest PAGE firm—

Write to PAGE FENCE ASSOCIATION in Monessen, Pa., Atlanta, Bridgeport, Chicago, Denver, Detroit, Houston, Los Angeles, New York, Philadelphia or San Francisco.

PRODUCT OF PAGE STEEL & WIRE DIVISION OF AMERICAN CHAIN & CABLE COMPANY, INC.

PRESSITE
an unsized fibreboard having excellent dielectric, physical and chemical properties. Is used principally in air, oil and askarel transformers.

ELECTRITE
a high grade board for electrical insulation, possessing high tensile and dielectric strength. Used in a large variety of punchings and other insulating applications.

DENSITE
an extremely hard and tough board of superior quality. Used by many leading manufacturers of electrical equipment to replace the more expensive types of insulating materials.

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FOR ELECTRICAL INSULATION

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BOOKS

Industrial Wiring

Interior Electric Wiring and Estimating—Industrial. **By Kennard C. Graham. Published by American Technical Society, 848 East 58th St, Chicago 37, Ill. 324 pages, illustrated. Price $4.95.**

A companion piece to *Interior Electric Wiring—Residential,* this book offers a practical approach to everyday industrial wiring, including cost analysis. Examples in it are planned to build the reader's knowledge of the National Electrical Code through natural association rather than memorization.

This book is clearly written and easy to read. Before launching into wiring problems, it first defines terms and equipment such as 'candlepower" and "split-phase motor." Ample illustrations, stripped of unnecessary detail, help the reader grasp the problems at hand. The author, an experienced engineer, covers such diversified topics as planning and installing nonresidential lighting (including fluorescent, incandescent, mercury, and sodium-vapor lamps), motor wiring, generators, power feeders, services, transformers, capacitors, industrial power distribution, and special circuits for x-ray, infrared, and welding equipment.

Utility commercial and industrial sales engineers would benefit by study of this book, although it is primarily addressed to plant electricians and contractors.

Magamps Analyzed

Magnetic Amplifiers. **By Dr. Herbert F. Storm, and nine General Electric associates. Published by John Wiley & Sons, Inc, New York 16, N. Y. 545 pages, illustrated. Price $13.50.**

The book's purpose is to explain the fundamentals of magnetic amplifiers, and to illustrate their principal uses. Directed to senior and graduate students pursuing electrical engineering, the book dissects magamps with scalpels of algebra and calculus to expose the technical secrets of these rugged, durable, and nonrotating control devices.

One chapter is devoted to peaking transformers, nonlinear resonance circuits, and reactors for large mechanical rectifiers. Six chapters touch lightly upon various applications of magamps. These applications range from the large and exceedingly complex stage lighting at the Radio City Music Hall in New York to the General Electric Co's sign in Schenectady—which has blinked unerringly, except during wartime blackouts, ever since Dr. C. G. Suits threw the switch in '32.

Designers of control devices will find this book useful as a source for basic and theoretical information about magnetic amplifiers.

Taps tight.... can't freeze!

Fully sealed grease chamber prevents corrosion
Heavy stainless steel spring washer compensates for expansion and contraction . . . prevents loosening.
Sure-Lok clampstick for installing clamps at extreme angles

KEARNEY
Protected-Thread
CON-NEC-TAP CLAMPS

Months or even years from now, Con-Nec-Taps are as easy to take off as they were to tap on, because the screw threads are completely enclosed in a grease-filled chamber. You'll never need to cut these clamps off the line . . . in fact, you'll save by being able to use them over and over again.

A heavy, double-coil spring washer resists vibration and compensates for expansion or contraction. You are sure of a high-pressure contact under all conditions. Kearney Con-Nec-Tap Clamps are available for all types and sizes of conductors.

New Process Plastic Pole Coating:

KEARNEKOTE* tough, high-dielectric plastic is bonded directly to the wood of KEARNEY Live Line poles.

*Registered Trade Mark. 278R

For Better Construction . . . Safer Maintenance

Specify **KEARNEY PRODUCTS**

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Take the "Heat Off"

hot weather overloads

— with Low-Cost *Thermalite* Indicators

The heat's on the distribution engineer when air conditioning loads go up. Here's how you can cool off the problem. Use *Thermalite* indicators to get advance warning that overloads are nearing the limits of transformer capability. You don't need time-consuming load surveys because a *Thermalite* indicator's clear signal light can be seen from a service truck. You get continuous, automatic indication of which units need attention. And you get it in time to make changes without disturbing service continuity.

How it works

Thermalite indicators do not affect transformer operation in any way. A thermal element located in the top oil, safely away from all live parts, actuates the signal lamp circuit. The brilliant signal lamp remains lit until reset by means of the convenient external handle. The *Thermalite* indicator will not operate on momentary overloads.

Get more from your distribution dollar

You can stretch transformer dollars by taking advantage of the inherent overload capability of distribution transformers on your system. Low-cost *Thermalite* indicators let you use this capability without endangering service continuity. You can get them on Allis-Chalmers distribution transformers 100 kva and smaller, 15 kv and below. Write or call your nearby A-C office, or Allis-Chalmers, Milwaukee 1, Wisconsin, for more information.

A-4639

Thermalite is an Allis-Chalmers trademark.

ALLIS-CHALMERS

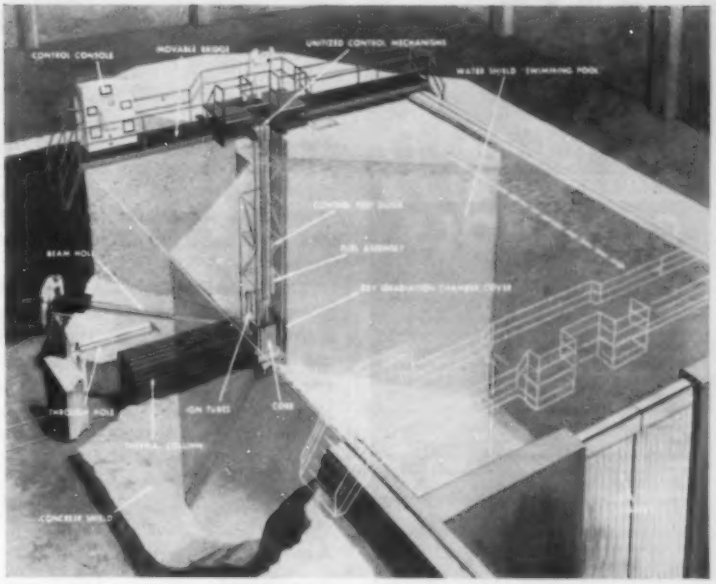
Atom Energy Gets Attention of Industry

AMF Plans Reactor For Private Research

American Machine & Foundry Co has completed plans for building a nuclear reactor to be owned and operated by a number of firms for research in industrial and humanitarian fields, stated Gen Walter Bedell Smith, vice chairman of board of directors.

The first reactor and its supporting laboratory facilities will cost between $1 million and $1.5 million. It can be constructed and available for use within 18 months. The facility will be built on a 250-acre site in the New York area.

The reactor will be the "swimming-pool" type, have a 1,000-kw rating and 10^{13} neutron per sq cm per sec thermal neutron flux. The design concept would be one of "unitization," resulting in ease of construction and prevents early obsolescence (EW, July 26, 1954, p. 130).



NUCLEAR REACTOR is planned as water-cooled, moderated and shielded type. Core will be similar to one at National Reactor Testing Station in Idaho.

Atomic Energy Progress by Westinghouse

Progress in the field of atomic energy in 1954, made by Westinghouse Electric Corp, is enumerated in the company's annual report to its stockholders. The achievements recorded were:

1. "Ground was broken for the nation's first full-scale atomic power plant for the generation of electricity, to be erected near Shippingport, Pa., 25 miles from Pittsburgh. Westinghouse will build the nuclear reactor for the new plant under contract with the Atomic Energy Commission. The Duquesne Light Co of Pittsburgh will itself finance and build the generating part of the plant, and will operate the overall plant.

2. "Westinghouse earned a major new assignment from the Atomic Energy Commission and the U. S. Navy for the development of a nuclear reactor suited to the propulsion of a large surface vessel.

3. "On September 30, the world's first atomic-powered submarine, the U.S.S. Nautilus, was formally commissioned in the U. S. Navy. A few weeks earlier, the Westinghouse atomic power division had completed delivery of the entire reactor plant to the shipbuilder. The Nautilus began her sea trials on January 17, 1955.

4. "The world's first privately-financed atomic equipment manufacturing plant started production near Cheswick, Pa. This plant, operated by the Westinghouse atomic equipment department, is manufacturing a growing volume of 'canned' motor pumps for atomic power application, the first product of a broad line of atomic plant components to be marketed.

5. "During 1954, the Westinghouse atomic power division leased facilities at Large, Pa., to engineer and procure non-nuclear components associated with the division's reactor projects. Under a study agreement with the Atomic Energy Commission, the company will also investigate at its own expense the new approaches in reactor technology that may lead to still greater progress toward the age of atomic power."

B&W to Build Reactor Parts Plant

Fuel elements and other reactor core components for the nuclear power industry are to be produced in a new plant planned by Babcock & Wilcox Co of New York. The plant is believed to be the first privately financed major unit for this type of manufacture.

The proposed plant will be about five miles east of Lynchburg, Va., on a 500-acre site bordering the James River. Main building will be a one-story, 100,000-sq ft structure. Construction is expected to start soon.

Atomic Production Safety

Dr John R. Dunning, dean of engineering at Columbia University, speaking on production of atomic energy, told a group of insurance men, "you should insist that you be given complete information as to safety standards developed thus far." He said there is no reason to classify this information.

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SAFETY
PROTECTION

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FOR PRESSURE & TEMPERATURE

Over a million of these mercury switch equipped controls are in use throughout every industry in the world SAFE-GUARDING costly equipment against HAZARDOUS pressure and temperature conditions.
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All types are bourdon tube operated and are equipped with external adjustments, visible dial and the famous Mercoid sealed mercury contact.

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Our engineers are at your service—send in your control problem or WRITE FOR CATALOG 700B

THE MERCOID CORPORATION
4211 Belmont Ave., Chicago 41, Ill.

Chance Co to Supply Laminated Pike Poles

Pike poles of bonded laminated Douglas fir are being constructed by A. B. Chance Co of Centralia, Mo. The company states that this is a solution to the shortage of Douglas fir in proper lengths for one-piece pike poles.

Chance claims that lamination insures straighter, more uniform poles and increases the stiffness over the solid poles. Moreover the company reports the tests on these new laminated pikes show them to be equal, and often superior, to single board pike poles.

The 2 and 2¼-in. dia laminated poles are made of two or more fir boards bonded together. The 2½-in. dia poles are produced from three or more fir boards bonded. Pole lengths range from 10 to 20 ft, in 2-ft increments. Maplac is also used as a protective coat on these poles.

American Standards Association Reports

As many as 1,440 American Standards are in use in the United States according to the annual report of the American Standards Association.

The number of American Standards approved in 1954 was 152, reported Vice Admiral George F. Hussey, Jr, U.S.N. (retired), managing director of the American Standards Association. Of these, 64 were new standards, 88 were revisions. The greatest number of new standards (25) was in the electrical field. Mechanical field had 11 and construction field had 9 new standards.

One of the most outstanding standards approved for the year was American Standard Requirements for Transformers (ASA-C57.12a–1954), stated Admiral Hussey. The committee chairman estimated that $100 million would be saved in the next three years.

"Electrical engineers will find it easier to speak the same language," said Admiral Hussey. "The American Standard Graphical Symbols for Electrical Diagrams has been revised, employing symbols familiar to the majority of engineers. Coordination of these symbols with international standards was carried out through the International Electrotechnical Commission." The new publication is ASA–Y32.2–1954.

A document which may affect every American industry and business is the American Standard method of recording and measuring injuries received at work (ASA–Z16.1–1954). The Bureau of Labor Statistics has put the standard into effect. Requests for 20,000 copies of the standard have been received, the admiral announced.

Last year was the first time there have been standards approved for office equipment, Admiral Hussey reported. Seven standards in this field for 1954, he pointed out, indicates a new trend.

Copper Production

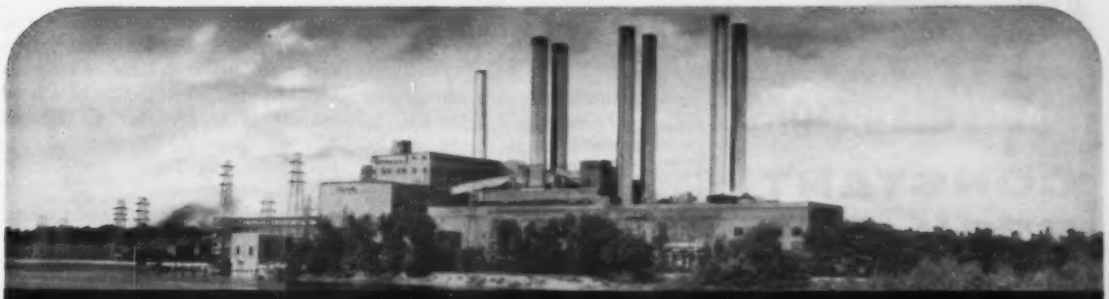
Primary copper production in U. S. was 87,350 tons in January, up from 85,581 tons in December 1954. Re-

(*Continued on page* 208)

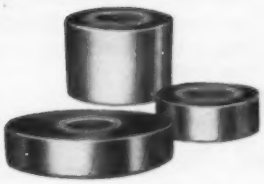
MANUFACTURERS' EARNINGS

Company	Months Ended		Net Income 1954	Net Income 1953	Earnings Per Common Share 1954	Earnings Per Common Share 1953
Allis-Chalmers Mfg Co	12	Dec 31	$26,130,430	$21,943,569	$7.20	$6.58
Babcock & Wilcox	12	Dec 31	15,212,000	12,061,000	9.78(b)	8.14(b)
Electric Controller & Mfg Co	12	Dec 31	1,003,117	1,318,979	4.71	6.20
Fairbanks, Morse & Co	12	Dec 31	2,478,198	4,262,734	2.03(l)	3.55(l)
General Motors Corp	12	Dec 31	805,973,897	598,119,478	9.08(b)	6.71(b)
Kennecott Copper	12	Dec 31	77,906,286	88,753,873	7.20	8.20
Koppers Co	12	Dec 31	6,125,329	9,025,981	2.77(c)	4.51(c)
Mallory & Co, P. R	12	Dec 31	1,071,803	2,547,813	1.20	3.72
Orangeburg Mfg	12	Dec 31	664,986	513,786	3.81	3.09
Sangamo Electric	12	Dec 31	1,600,944	1,967,623	2.00(m)	2.46
Square D Co	12	Dec 31	4,680,617	4,386,152	3.40	3.19
Standard Oil Co of Ind	12	Dec 31	117,156,768	124,826,397	3.73(n)	4.06(n)
U. S. Rubber Co	12	Dec 31	27,958,902	32,732,300	4.29	5.19
Wagner Electric	12	Dec 31	1,936,723	3,236,459	2.05	3.43(c)
Westinghouse Elec	12	Dec 31	84,594,367	74,322,925	5.06	4.53

Notes—(b) Based on average number of shares outstanding during the period. (c) Based on shares now outstanding. (l) Adjusted for 2-for-1 common share reclassification, effective Dec. 14, 1951. (n) Based on average number of issued shares: 1953 share earnings adjusted for 100% stock dividend paid in December, 1954. (m) On 800,000 shares outstanding December 31, 1954.



Power-plant problems solved right here:



INSULATING? Solve it with "SCOTCH" Brand Plastic Electrical Tapes! Plastic backing resists weathering and sunlight, acids, oils, alkalies and water. Widely used for splicing and insulating. Three thicknesses: 7 mils (No. 33), 10 mils (No. 22), 20 mils (No. 21).

PADDING? Solve it with "SCOTCHFIL" Electrical Insulating Putty! Comes in a 1½ in. x 5 ft. roll, applies like tape. Easily moulded as padding for bus bars, odd-shaped terminals and fittings. Excellent cable build-up for splicing. Gives smooth taping surface.

CORROSION? Solve it with "SCOTCHRAP" Pipe Insulation Tape! It's a tough polyvinyl chloride film with a pressure-sensitive adhesive. Resists abrasion, galvanic and electrolytic action on buried pipe. Two thicknesses: 10 mils (No. 50), 20 mils (No. 51).

SPLICING? Solve it with "SCOTCHLOK" Electrical Spring Connectors! Steel spring construction grips the wires tight—actually *threads* the wires for extra-strong hold. "SCOTCHLOKS" never shake loose! Four sizes for wire gages from 18 AWG to 2 AWG.

HIGH HEAT? Solve it with "SCOTCH" Brand Electrical Tape No. 27! Glass cloth backing won't burn. Thermosetting adhesive cures to form a permanent bond of great strength. Ideal for insulating and splicing wherever high heat is a problem. ½ in. x 66 ft. rolls.

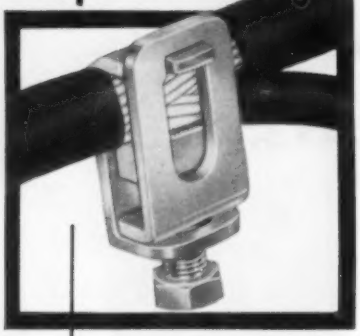
SEALING? Solve it with "SCOTCHCAST" Resin No. 4 in the "UNIPAK" Container. Premeasured resin and activator are mixed by squeezing "UNIPAK" envelope. For cable splicing, sealing fittings against dust, moisture, explosive atmosphere.

Reg. U.S. Pat. Off.

SCOTCH BRAND Electrical Products

The term "SCOTCH" and the plaid design are registered trademarks for the more than 300 pressure-sensitive adhesive tapes made in U.S.A. by Minnesota Mining and Mfg. Co., St. Paul 6, Minn.—also makers of "SCOTCH" Brand Magnetic Tape, "Underseal" Rubberized Coating, "Scotchlite" Reflective Sheeting, "Safety-Walk" Non-slip Surfacing, "3M" Abrasives, "3M" Adhesives. Export Sales Office: 99 Park Avenue, New York 16, N. Y. In Canada: P.O. Box 757, London, Ontario.

NEW IDEAL
Tap Connectors
CONSTANT
RESILIENT
PRESSURE
Keeps Joints Tight



● IDEAL Tap Connectors give you a tighter, stronger connection that is continuously under spring tension. Because they are made of resilient, cold-worked steel (zinc dipped) their grip is not affected by temperature changes and contraction or expansion of either the wire or connector. Their unique design also provides *more* contact area, *more* mechanical strength, *greater* pressure on the joint. Contacts are better, wires can't work loose, burnouts are practically eliminated.

IDEAL Tap Connectors are easier to use. There are no parts to come loose, just a single unit to handle. Easier to stock, too, because only three sizes handle all wire combinations from 2 No. 1 wires to one No. 10 and one No. 12 or one No. 8 and one No. 14. Available *without* spacer bars for copper-to-copper or aluminum-to-aluminum, *with* spacer bars for copper-to-aluminum, copper-to-steel or aluminum-to-steel.

COST LESS! IDEAL Tap Connectors are lower in price than other connectors for practically every combination.

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1021 Park Avenue, Sycamore, Ill.
Please send catalog data on IDEAL Tap Connectors
Name
Company
Address
City Zone State

Copper Production

(*Continued from page* 206)

fined production was 123,840 tons in January, down from 133,523 tons in December which was the highest in 1954. Deliveries to fabricators was 113,949 tons in January, compared to 119,626 tons in December which included tonnage delivered from government stocks and imports of foreign copper for account of Copper Institute members and others. Refined stocks in January was 45,982 tons, down from 47,108 in December, 1954; the high in 1954 was 126,470 tons in March and low was 33,290 tons in October.

Aluminum Production

U. S. primary production of aluminum, according to the Aluminum Association, was 128,203 tons in January 1955. This is an increase over the 127,034 tons in December 1954, and 116,246 tons in January 1954.

Exide's New Research Div.

Creation of a new research division on the corporate level and expansion of research activities of the Electric Storage Battery Co is under the direction of Dr. L. E. Lighton, vice president of the company. Research for all company divisions will be separated from development engineering and will be carried on in a new center at the Crescentville plant in Northeast Philadelphia.

MANUFACTURING BRIEFS

General Electric Co Items

• A $15 million plant is to be started soon in Tyler, Texas, for expanded production of home cooling units. It will have 350,000 sq ft floor area and is scheduled for operation in 1956. S. J. Levine, general manager of the home heating and cooling department, said that the company's sales of home cooling units has increased 10 times in the last two years.

• Liquid rheostat capable of dissipating 3,300 kw, reportedly largest of its kind in world, will be used to vary current passing into giant heaters that regulate temperature of air passing through the test section of a wind tunnel. It is for the Air Force's Arnold Engineering Development Center, Tullahoma, Tenn.

• Snohomish County PUD of Everett, Wash., has ordered nine transformers for $118,233. Three 500-kva transformers will be installed in the Arlington substation and three each 2,500-kva units in proposed substations at East Stanwood and Mountlake Terrace.

• New type electronic computer capable of remembering up to 2,000 ten-digit numbers and locating anyone of them in less than three thousandths of a second has been put in operation recently. This IBM type 650 magnetic drum data processing machine analyzes complex electrical system generating, transmission and distribution problems.

Ansul Chemical Co of Marinette, Wis, has scheduled an industrial fire-fighting school for twelve three-day classes —May 23-25, June 6-8 (assigned to du Pont Co), June 13-15, 20-22, 27-29, July 18-20, 25-27, August 15-17, 22-24, 29-31, Sept 12-14, 19-21. Registration is limited to 25 persons in each class. For further information write to Director Fire School at Ansul Chemical Co.

Hess, Goldsmith & Co of New York, a large weaver of fiber glass, will open a Western division, effective April 15. Offices and warehouse will be at 313 E. Washington Blvd, Los Angeles. Paul A. Erskine has been named Western Division Manager.

American Hoist & Derrick Co of St. Paul, Minn., has acquired the Thomas Laughlin Co of Portland, Maine. American Hoist will offer a line of fittings and wire rope accessories, including Crosby clips and Crosley load rated wire rope blocks. The Portland plant will be operated as the Thomas Laughlin Division.

Graybar Electric Co has purchased a 215 x 400 ft site at E. Tallmadge Ave and Industrial Parkway, Akron, Ohio. Reportedly planned is a brick structure with a floor area of 38,000 sq ft, providing 2.5 times as much area as the present quarters.

DUXSEAL®

plugs 'em fast-to last!

DUXSEAL is a nonhardening adhesive plastic compound made with an asbestos base. It is the ideal general utility sealing and caulking compound for duct openings, potheads, bushings, terminal boxes, and for filling multi-wire contact boxes indoors. Use it like putty, just as it comes from the handy package, for smooth, workmanlike jobs.

Duxseal stays plastic—will not slump, melt or run under ordinary temperatures. Clings to duct walls and cables but flexes with expansion and contraction. It is unaffected by water and gases, does not react with rubber, metals or painted surfaces. For full information write Johns-Manville, Box 60, New York 16, N. Y. In Canada, 199 Bay St., Toronto 1, Ontario.

JM

Johns-Manville
SEALING COMPOUNDS

SALES ASSIGNMENTS

COMPANY STAFFS

Allis-Chalmers Manufacturing Co, Milwaukee, has assigned Robert A. Reynolds to the Houston, Tex., district as a sales representative. Reynolds was formerly an application engineer in the rectifier sales group at Allis-Chalmer's West Allis Works.

D. W. Onan & Sons, Inc, Minneapolis, has designated John B. Janusz of Montreal as new zone manager for Onan products in eastern Canada. An electrical and mechanical engineer, Janusz has had previous experience in the electrical manufacturing field.

Line Material Co, Milwaukee, has announced the following managerial field assignments for three new sales offices and warehouses: E Bynum, branch manager, and B. E. Adair, field engineer, at Nashville; C. A. Paynter, branch manager, and A. G. Simpson and P. B. Holden, field engineers, Seattle; W. T. Neikirk, district manager; T. Frost, branch manager; and E. M. Stites, field engineer, at San Francisco.

Graybar Electric Co, Inc, New York, has appointed R. N. Ness as manager for the San Antonio, Tex., territory. Ness has been manager of district appliance sales at Dallas.

Tubular Products Division of The Babcock & Wilcox Co has designated J. N. Rogers as a district salesman assigned to the St. Louis office. Rogers has been office manager at the division's Chicago sales office.

American Steel & Wire Division of United States Steel Corp has made these appointments: Charles H. Eisenhardt, Jr, as sales manager for the Cleveland district to direct sales in northern Ohio; George C. Brandle as director of central area electrical sales. Eisenhardt has been with the company division since 1925; Brandle, since 1928.

REPRESENTATIVES

Pyle-National Co has appointed the firm of Walker & Rosche, Baltimore, Md., as field representative to handle the industrial line of electrical equipment in the Baltimore area.

High Voltage Insulator Division of Porcelain Products, Inc, Parkersburg, W. Va., has designated the John Carter Agency, Lake Wales, Fla., as its sales agent in Florida and southern Georgia.

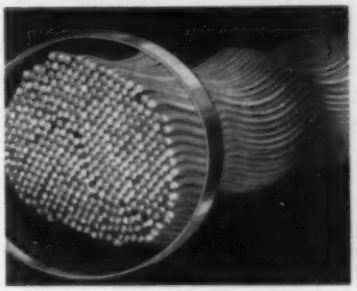
Plans $35-Million Section

Union Electric Co of Missouri will add a $35-million third section to its Meramec plant in south St. Louis County. The new section will house a turbogenerator with a maximum capacity of between 200,000 and 250,000 kw. Plant's present two units are rated at 140,000 kw each. The addition is scheduled to be completed sometime in 1958.

RIGHT TURN

The "right turn" on armor rods means a great difference in speed of application and dependability of performance. To get both, always specify

fine FANNER superformed ARMOR RODS



Exclusive end chamfering completely eliminates burrs and sharp edges. No No danger of nicking conductors . . . or scratching linemen's hands.

Exclusive forming method provides precisely formed rod contours, held to extremely close tolerances, and free of surface blemishes.

Improved rod designs, tailored for easy application and made of high grade spring-type alloys, result in a tight grip and the elimination of "crowding."

Patent No. 2,275,019 and other patents pending

Wide range of sizes available for shipment from stock in improved packages. With all these extra features (and more too), fine Fanner Superformed Armor Rods cost you no more. Write today to be placed on our mailing list.

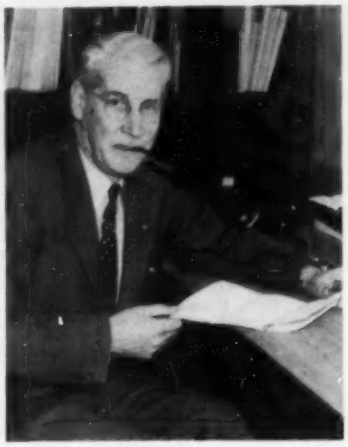
THE FANNER MFG. CO.
Brookside Park • Cleveland 9, O.
Established 1896

Habberley Promoted to Executive VP

Robert R. Habberley, vice president in charge of operations for the Western Massachusetts Electric Co, has been elected executive vice president of that organization as well as its parent holding company, the Western Massachusetts Companies.

Since joining Western Massachusetts Electric's engineering department in 1930 with extended experience in transmission and distribution behind him, Habberley has advanced through several executive posts.

In 1945 he was made assistant general superintendent in charge of all divisions, and late in 1946 he was appointed director of economics and presidential assistant on construction. To perform his new duties, he moved from Springfield to executive headquarters at Greenfield.



ROBERT R. HABBERLEY

Three years later Habberley was elected a vice president, responsible for the supervision of the construction budget, direction of activities of the purchasing, real estate, and right-of-way departments, and co-ordination of general system activities.

Habberley's next promotion came in 1953 when he was made vice president in charge of operations for the utility. He was elevated from this post recently to the office of executive vice president. His headquarters remain at Greenfield.

Habberley also has served as president of the Engineering Society of Western Massachusetts.

Argue Appointed Stone & Webster VP

Appointment of Fred W. Argue as a vice president has been announced by Stone & Webster Engineering Corp.

Argue will continue his work as engineering manager of the company, a post he has held since last April. He joined the company in 1941 and was promoted to assistant engineering manager in November 1952.

As vice president, Argue will remain in the Boston office of Stone & Webster Engineering Corp.

F. W. ARGUE

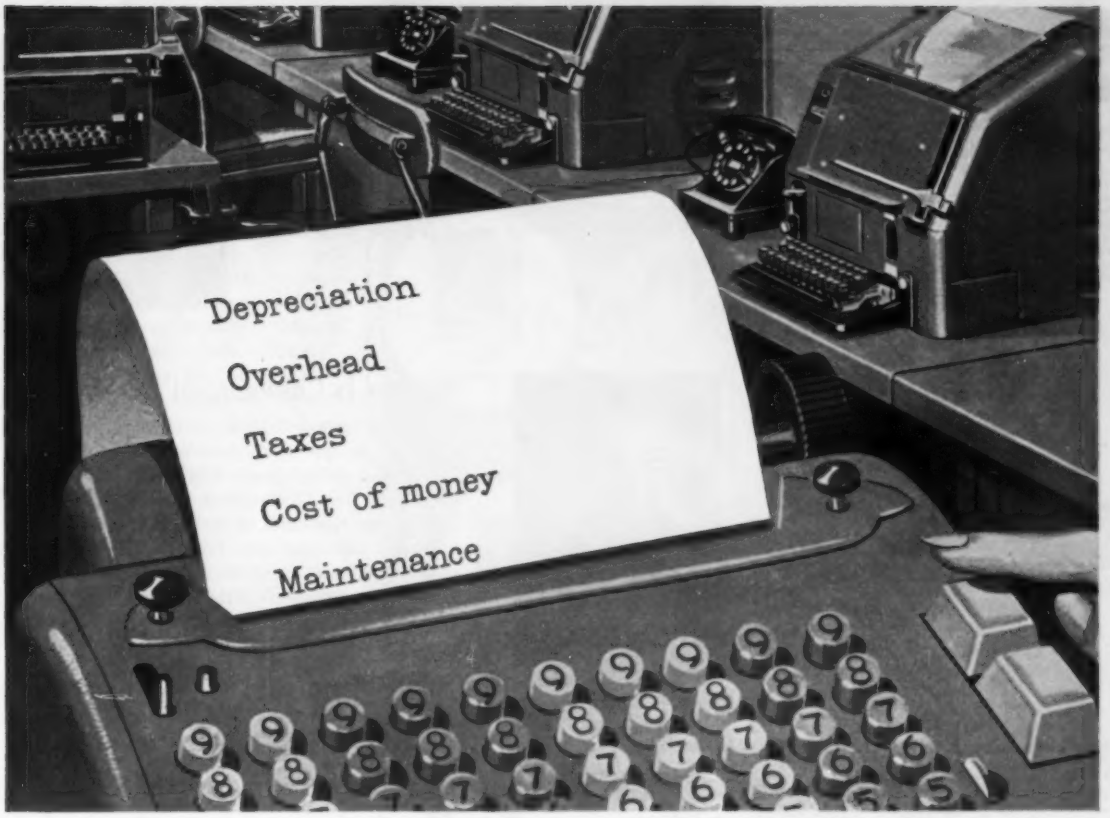
B. H. REEVES

Rockbestos Elects Reeves President

Rockbestos Products Corp, New Haven, Conn., has announced that Beauford H. Reeves has been elected its new president, succeeding the late Arthur Grove Newton who died March 3.

Reeves first joined Rockbestos as an engineer in 1923. He has been vice president and general manager since 1936. Previous to his connection with Rockbestos he worked as a sales engineer for Johns-Manville in Cleveland.

The new president is a graduate of the University of Michigan and a veteran of World War I, in which he served as a captain in the Army.



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HAVE YOU ADDED UP ALL THESE COSTS?

Owning and operating your communications system can be a costly experience, with many costs frequently overlooked. Depreciation, taxes, overhead, maintenance, loss of interest on capital all contribute to your total communication expense.

Bell System communications are low in cost. You pay only a fixed monthly charge for services and facilities tailored to your exact needs. No more, no less. Your capital is not tied up but left free for income-producing investments in *your* business.

The installation of your communications is just the beginning of the Bell System job. Maintenance, replacement, inventory, storage, extension and rearrangement are all handled rapidly and efficiently—no longer problems for you.

Let us show you how Bell System know-how and experience can be put to work to solve your communications problems. For a complete communications study, made without charge, call your local Bell Telephone representative today.

TELEPHONE

TELETYPEWRITER

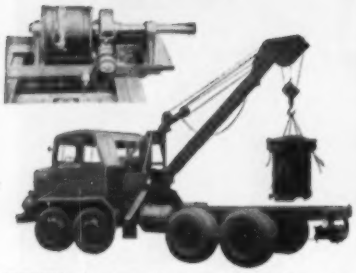
MOBILE RADIO

METERING CHANNELS

BELL TELEPHONE SYSTEM

Utilities Have Specified
SILENT HOIST Equipment
• Since 1918 •

KRANE KAR Swing-Boom Mobile Crane: for materials-handling . . . lifting, transporting, positioning, gasoline or Diesel, 1½, 2½, 5 and 10 ton capacities, 9 to 37 ft. booms (or telescopic booms); solid or pneumatic tires. Self-stabilizing without jacks or outriggers; unobstructed vision; fast, flexible, safe, easy to operate.



WINCHES: Capstans; Single and Double Drum, Jaw Clutch, Keyed and Friction Clutch Winches. 2,000 to 50,000 lb. Capacities.

SWING-BOOM CRANES: Truck: Motor Power Operated; high capacity; takes up only a small space for handling transformers, cable reels, lamp posts, trees, poles, manhole castings, etc., 9 to 31 ft booms; one to 10 ton capacities.

TOWERS: 2 or 3 section type and Pantograph types, with plain, revolving or racking platforms.

TRIPOD POLE DERRICKS: for 35 ft., 45 ft., and 60 ft. Poles; single piece or telescopic side legs; removable cast steel fittings.

USERS: AT&T; N. Y. Tel. Co.; T.V.A.; Consolidated Edison Co.; W U.; Municipalities throughout America.

WRITE FOR CATALOGS:
No. 79—KRANE KAR *No. 70—Truck Equipment*

THE ORIGINAL SWING BOOM MOBILE CRANE WITH FRONT-WHEEL DRIVE AND REAR-WHEEL STEER
½, 1, 2½, 5 AND 10 TON CAPACITIES
KRANE KAR
TRADE MARK REGISTERED
SILENT HOIST & CRANE CO.
862 63rd St., BROOKLYN 20, NEW YORK

Heads Wiremold

John Davis Murphy has been elected president and Robert Henry Murphy executive vice president of the Wiremold Co, Hartford, Conn.

Since he joined the company in 1934, J. D. Murphy has served as vice president, board member and executive vice president.

R. H. Murphy, who has been with the company since 1936, also has served as a vice president.

J. D. MURPHY

Walker Is Commercial VP

General Electric Co has announced the appointment of Clarence C. Walker as commercial vice president of the company's San Francisco territory to succeed Ray W. Turnbull, who will act in an advisory capacity until his retirement in June.

Walker has been with GE for 34 years and, since 1948, vice president and general manager of the Construction Materials Division headquartered at Bridgeport, Conn.

C. C. WALKER

PERSONAL BRIEFS

J. R. Snider, president of Tucson Gas, Electric Light & Power Co, has been elected chairman of the board; he will continue to serve as president.

F. E. L. Whitesell, formerly vice president in charge of sales for the Burndy Engineering Co, has been appointed executive director of Electrical Equipment Representatives Association, succeeding the late **Edwin C. Minteer** . . . Line Material Co, Milwaukee, has announced that **T. J. Andersen** has been appointed general manager of Illinois Electric Porcelain Co, a McGraw Electric Co subsidiary in Macomb, Ill., operated and managed by L-M. **J. G. Everhart,** chief engineer at L-M's transformer plant, succeeds Andersen as plant manager of the fibre products plant, Sherman, Tex. **R. P. Thompson** has been promoted from assistant chief engineer to chief engineer at Zanesville, Ohio. **M. I. Zwelling,** formerly chief laboratory engineer, replaces Thompson.

R. W. Hutchinson, with Federal Pacific Electric Co organization since 1946, has been appointed product sales manager for the company's Pacific Switchgear Division with offices in San Francisco . . . General Electric Co has announced that **Edwin E. Parker** has been appointed general manager of its instrument department, filling the post held by **C. Howard Black,** recently named general manager of the Construction Materials Division at Bridgeport, Conn. . . . **John R. Pattee,** formerly associated with Cambridge Instrument Co, has been appointed supervisory engineer of research and development with the Instrument Division of Roller-Smith Corp, Bethlehem, Pa. . . . **Frank L. Whitney,** corrosion consultant for the general engineering department of Monsanto Chemical Co, St. Louis, has been elected president of the National Association of Corrosion Engineers.

Philadelphia Electric Co has announced the following appointments: **Milton I. Allen,** marketing assistant to vice president in charge of sales, was made general sales manager; **Albert G. Garrigues** has been advanced from assistant manager to manager of the Retail Division; **William H. Jones,** who will continue as purchasing agent,

has been named manager of purchasing and service operations; **Austin Monty,** formerly manager of the residential department, has been appointed sales consultant in the sales department; **Philip M. Alden,** until recently manager of Retail Sales Division, has been assigned as sales manager of the residential department; **Frank E. Cheney** moves from manager of the Domestic Applications Division to manager of the merchandise sales department, **Maxwell Cole** has been appointed assistant sales manager of industrial and retail department; **Frank C. Shermer** succeeds Cole as manager of Market Studies and Service Division; **Charles C. Shotwell** replaces Shermer as manager of industrial engineering in the Philadelphia Division; and **Arnold D. Spillman** succeeds Shotwell as assistant manager of Market Studies and Service Division.

M. H. Montross, manager of the Wisconsin Valley Division of Wisconsin Public Service Corp, has been elected a director of the Wisconsin River Power Co . . . Adams-Marquette Electric Co-operative, Friendship, Wis., has announced the election of **Hans Pedersen** as a member of its board.

OBITUARY

John Wicks, 68, former sales manager for the Okonite Co in Wilkes-Barre, Pa., died this month at his home in Philadelphia. After 44 years with Okonite, Wicks retired in 1953.

Henry V. Nye, 69, who retired last June after 48 years as an engineer for Allis-Chalmers Manufacturing Co, died recently at his home in Milwaukee. At the time of his retirement, Nye was consulting engineer on switchgear equipment for Allis-Chalmers.

Wilbert D. Gorman, 71, consulting illuminating engineer for the Hartford Electric Light Co and an employee of that utility for 40 years until his retirement in 1949, died last month at Hartford.

Lem Ellsworth Hendee, 82, who helped found Line Material Co in 1914 and retired as an officer of the firm in 1953, died this month in Milwaukee.

SUPERIOR SWITCHBOARD & DEVICES CO.
CANTON, OHIO
A subsidiary of The Union Metal Manufacturing Company

ANSONIA
Ankoseal®
ALL-PLASTIC
QUALITY cables

1. provide distribution circuits
2. deliver power to homes and factories

The quality of Ankoseal is insured by rigid controls during manufacture. The results are high dielectric strength, dependability, long service life and quality service at low cost. Made for aerial, duct and direct burial installations. *Write for information on specific installation requirements.*

THE ANSONIA WIRE & CABLE COMPANY
ANSONIA, CONNECTICUT

THIEL
TRANSFORMER HANGERS

Heavy-gauge steel construction, hot-dip galvanized for long life. Designed to NEMA specifications. Furnished with galvanized bolts and nuts.

MODEL C-1
for 75-100 KVA 1-Phase

MODEL C-3
for 75-112½ KVA 3-Phase

IN STOCK

T-TYPE HANGERS
In two sizes. For 3-50 KVA 1-Phase and 9-45 KVA 3-Phase transformers.

HANGER KICKERS
In sizes to fit T-type hangers.

THIEL TOOL AND ENGINEERING CO.
1417 No. Market St. • St. Louis 6, Mo.

Specify PALNUTS on new lines . . . add PALNUTS to existing lines, to eliminate further re-checking and re-tightening of bolts. PALNUT Locknuts are the lowest cost, most dependable method of locking steel tower bolts. Once tightened, their double locking spring action holds tight under severest vibration. PALNUTS are extremely low in cost, require only three bolt threads, apply fast, may be removed and reused. Hot Dip Galvanized and other finishes and materials used by utility industry. Free samples on request.

The PALNUT Co.
51 Cordier St.
Irvington 11,
New Jersey

PALNUT
TRADE MARK
LOCK NUTS
for quick, secure fastening at low cost

MEETINGS CALENDAR

An extended list of coming meetings appears in the last issue of each month

MARCH

SOUTHEASTERN ELECTRIC EXCHANGE—Annual Meeting, Boca-Raton Hotel and Club, Boca Raton, Fla., March 21-23.

INSTITUTE OF RADIO ENGINEERS—National Convention, Waldorf-Astoria Hotel, New York, March 21-24.

ROCKY MOUNTAIN ELECTRICAL LEAGUE—Electric Meter Institute, University of Denver, Denver, Colo., March 21-25.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS—Management Conference, Hotel Statler, Cleveland, Ohio, March 23-24.

MISSOURI VALLEY ELECTRIC ASSOCIATION—Engineering Conference, President Hotel, Kansas City, Mo., March 23-25.

OKLAHOMA UTILITIES ASSOCIATION—Annual Convention, Mayo Hotel, Tulsa, Okla., March 24-25.

CONTROLLERS INSTITUTE OF AMERICA—Southern Conference, Mayo Hotel, Tulsa, Okla., March 25-26.

EDISON ELECTRIC INSTITUTE—21st Annual Sales Conference, Edgewater Beach Hotel, Chicago, March 28-31.

AMERICAN POWER CONFERENCE—17th Annual Meeting, Sherman Hotel, Chicago, March 30-April 1.

ILLUMINATING ENGINEERING SOCIETY—Southwestern Regional Conference, Ft. Harrison Hotel, Clearwater, Fla., March 31-April 1.

APRIL

ILLUMINATING ENGINEERING SOCIETY—Southwestern Regional Conference, Gunter Hotel, San Antonio, Tex., April 3-5; Inter Mountain Regional Conference, Westward Ho Hotel, Phoenix, Ariz., April 11-13; South Pacific Coast Regional Conference, Statler Hotel, Los Angeles, April 14-15; Pacific Northwest Regional Conference, Harrison Hot Springs Hotel, Harrison Hot Springs, B. C., April 24-27.

AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS—Subcommittee on Rubber and Plastics Industries of the Committee on General Industry Applications, Mayflower Hotel, Akron, Ohio, April 4-5; Southern District Meeting, Sorono Hotel, St. Petersburg, Fla., April 13-15.

ATOMIC INDUSTRIAL FORUM, INC—Meeting on "Atomic Energy—The New Industrial Frontier," jointly sponsored by Stanford Research Institute, Mark Hopkins Hotel, San Francisco, April 4-5.

15TH ANNUAL YOUNG MEN'S UTILITY CONFERENCE—Ipalco Hall, Indianapolis Power & Light Co, Indianapolis, Indiana, April 6-7.

PACIFIC COAST ELECTRICAL ASSOCIATION—Joint Conference with Pacific Coast Gas Association, Administrative Services and Accounting Section, Jokane Inn, Phoenix, Ariz., April 7-8.

SOUTHEASTERN ELECTRIC EXCHANGE—Engineering and Operation Section, Roosevelt Hotel, New Orleans, Louisiana, April 7-8.

*__EDISON ELECTRIC INSTITUTE__—14th Joint AGA-EEI Conference on Operation of Public Utility Motor Vehicles, Netherlands-Plaza Hotel, Cincinnati, April 12-15; Industrial Relations Committee, EEI Headquarters, New York, April 21; Hydraulic Power Committee, Atlanta-Biltmore Hotel, Atlanta, Ga., April 25-26; EEI-AGA 1955 National Conference of Electric and Gas Utility Accountants, Conrad Hilton Hotel, Chicago, April 25-27; Meter and Service Committee, Washington-Duke Hotel, Durham, N. C., April 25-27.

NORTHWEST ELECTRIC LIGHT & POWER ASSOCIATION—Engineering and Operation Section with Personnel and Safety Section, Davenport Hotel, Spokane, Washington, April 13-15.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS—Spring Meeting, Lord Baltimore and Southern Hotels, Baltimore, Md., April 18-21; Region VIII Meeting, Rice Hotel, Houston, Tex., April 25-26.

NORTHWEST PUBLIC POWER ASSOCIATION—Annual Meeting, Eugene Hotel, Eugene, Ore., April 20-22.

ROCKY MOUNTAIN ELECTRICAL LEAGUE—Annual Spring Conference, Shirley-Savoy Hotel, Denver, Colo., April 24-26.

AGRICULTURAL AND MECHANICAL COLLEGE OF TEXAS—8th Annual Conference for Protective Relay Engineers, Sponsored by Department of Electrical Engineering, College Station, Tex., April 25-27.

CONTROLLERS INSTITUTE OF AMERICA—Eastern Conference, Royal York Hotel, Toronto, Ontario, Canada, April 28-30.

PENNSYLVANIA ELECTRIC ASSOCIATION—Spring Meeting, Meter Committee, Washington-Duke Hotel, Durham, N. C., April 28-29.

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*Additions this week

Personnel Savings

(*Continued from page* 109)

ers are fully aware and definitely appreciate these benefits. The advertising and selling approach which emphasizes the need of constant repetition is required if employee appreciation is to remain high. If employee appreciation is at a high level, it is almost axiomatic that employee cooperation will also be at a high level.

Communications Have Been Neglected . . . The over-all communications program covers communications from the top brass down, from the lowest level of employment up as well as laterally at the supervisory and management level.

Included in this communications program are suggestion systems, company magazines, bulletin boards, information racks, personal letters, pay-roll enclosures, moving pictures, meetings, day-to-day relationships, and printed material on specific subjects.

The area of communications in industry has over the years been neglected and ineptly administered. The result has been that other organizations which sell ideas and philosophies diametrically opposed to the American enterprise system and damaging to employee morale have captured the minds of many employees.

This phase of manpower management represents a vital and powerful tool in the process of production for profit. It is high time that careful and studious planning be given to the purpose of communications. It is a job the top man in personnel must supervise. It calls for concentrated, intelligent action.

Profits Mean Job Security . . . There is no reason why every function of personnel administration should not be directed toward making a profit for the company. Neither is there any conflict between the welfare of the employees individually or as a group and the need of profit.

It is interesting to note the attitudes of two great men, each a statesman in his own field, regarding profits. Winston Churchill said, "It is a socialist idea that making profits is a vice. I consider the real vice is making losses." Samuel Gompers said at the time he was trying to organize labor in this country, "It is an evil thing for a business not to make a profit."

PREMAX MARKERS OUTLAST THE POLE!

Far superior to old fashioned stencil marking methods. Premax embossed aluminum markers are now available for every type of pole, steel tower, transformer, switch and cable identification, plus markings for identification by aerial patrol. Both standard and special designs. Ask your jobber or write for complete information.

PREMAX PRODUCTS
Division Chisholm-Ryder Co. Inc.
5507 Highland Ave., Niagara Falls, N. Y.

Rush Aluminum Cable Brush Removes Oxide without Damaging Surface

For Positive Electrical Connection

The Rush Aluminum Cable Brush consists of thousands of specially bonded glass fibers which surround the aluminum strands and remove surface oxide quickly, easily and without damage. Glass fibers are wound with tape which can be unwound as the fibers wear down, resulting in long service life.

Guaranteed to Satisfy or Your Money Back. Order Today

No. 145-11-1, 1" dia. x 6" long, $3.24 ea.
No. 145-11-2, ⅝" dia. x 6" long, $1.75 ea.

THE ERASER CO., INC. 1068 S. Clinton St., Syracuse 4, N. Y.

free

send for this catalog describing acker's new all-purpose digger

Send the coupon today for your copy of our new catalog showing the wide range of application as well as the many exclusive features that make the Acker All-Purpose Digger the most versatile and useful you can buy!

TWO MODELS TO CHOOSE FROM — Jeep mounting with compact, power take-off or skid-mounted with self contained power plant for truck mounting.

ACKER DRILL CO., Inc.
725 W. Lackawanna Avenue, Scranton, Penna.

Please send me free copy of Bulletin 40. EW.

Name_____ Title_____

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REEL-O-MATIC SAVES TIME AND LABOR
IN HANDLING CABLE, WIRE ROPE, MESSENGER STRAND

You'll find the new REEL-O-MATIC quickly pays for itself . . . saving you money because it actually does the work of four men! In a matter of minutes, one man can measure, coil and cut an order to specification . . . saving time, handling and labor! REEL-O-MATIC does a better job faster.

In addition to a complete line of standard models, such as Model "A" shown above, special REEL-O-MATICS are constantly being developed to suit specific needs . . . the REEL-O-MATIC principle has been successfully adapted to meet many unusual requirements of the United States Government and private industry. To ease your cable and wire handling problems, investigate REEL-O-MATIC today! *Write for free catalog* describing the complete REEL-O-MATIC line of cable and wire rope handling equipment . . . ask for engineering advice on special problems.

REEL-O-MATIC CORPORATION of AMERICA, Columbia 2, Pa.

Another Job Done Better With The ALL-NEW 'Jeep'®

LINE CONSTRUCTION

Good road, bad road or no road—it's all the same to the Universal 'Jeep'. Its *Hurricane* Engine, 4-wheel-drive and maneuverability put the 'Jeep' in a class by itself—a stop-at-nothing vehicle you can rely on to take men and tools where they are needed. When there is work to be done far from the highway, the 'Jeep' becomes an *indispensable* tool for getting jobs done. Let a 'Jeep' dealer show you what this vehicle can do.

WILLYS MOTORS, INC.
TOLEDO 1, OHIO

The 'Jeep' Family of 4-Wheel-Drive Vehicles . . . UNIVERSAL 'JEEP' • TRUCK • STATION WAGON • PANEL DELIVERY

THE WORLD'S MOST USEFUL VEHICLES

Computers

(*Continued from page* 130)

sumption is interspersed gang punched from the billing cards into the transformer cards. The transformer cards are sorted into three groups according to kwhr per customer per month. Cards are then group sorted again according to transformer-location order, and a group code and corresponding conversion factors punched into them.

Cards are then tabulated on an accounting machine, and summary cards produced by groups for each transformer. These cards will have total kwhr of each group and corresponding conversion factors. Summary cards are next run through an IBM type 604 calculating machine which calculates and checks the kva loads and converts them to percentage of nameplate rating. The summary cards are then run through another accounting machine which lists them and prints a report sheet showing transformer location number, kva size, number of customers in each group and total on each transformer, conversion factors, group and total kwhr consumption, calculated kva load, and load in percent of nameplate rating.

Transformer Change Schedule . . . Both utilities use 150% of nameplate rating as the point for changing out transformers or reducing transformer loading. Calculation runs are made once a year, usually after the summer peak has passed. The billing period chosen is that having the greatest number of days with temperatures above 90F. As the summary of transformer loads is usually available in September or October, several months remain in which the utilities can correct overloaded-transformer conditions before the peak summer loads recur.

The procedure outlined requires that distribution record maps and transformer card files be maintained on a current basis. In maintaining the file, it is not neecssary to keep pace with new customers, or the usual turn-ons and turn-offs on a daily basis. These changes are caught when the cards are collated with the billing cards. Transformer changes, however, must be recorded as they occur. New units must be assigned location numbers and key-punch transformer header cards. When the change involves different kva size, this too must be recorded.

Punching in customer cards need

not be corrected to ranges in size or location number. These cards can be transferred in their file from one transformer location to another. Accounting machines correct kva size and location number in the customer cards from the transformer header card when a calculation is run.

Costs . . . Costs of setting up this system vary, depending on the size of the city or area involved. Based on experience at Ft. Worth, Little Rock, and several smaller cities, set-up costs approximate $3.50 per transformer. The annual or continuing costs are approximately 70¢ per transformer. Continuing expense includes maintenance of card files, machine accounting department processing of the cards, load reporting, installing test meters, analysis of test results, and modification of conversion factors.

Washington State PUD's Reveal Expansion Plans

PUD's in Washington State plan to spend more than $6 million this year for new equipment and supplies, according to Ken Billington of Seattle, executive secretary of the Washington State PUD Association.

Plans call for 600 miles of line, costing $2,200,000; 6,000 utility poles, $600,000; service lines for 9,500 more homes, $600,000; $275,000 for equipment; construction of eight new substations and improvement of ten existing substations, $1 million; building or remodeling warehouses, service and office headquarters, $1,590,000.

The Snohomish County PUD alone will make capital expenditures totaling $2,201,000, including completion of its main service building at Everett, construction of a service building at Lynnwood and two substations, and a major line extension program .

The Chelan County PUD will construct a headquarters building in Wenatchee at a cost of $474,053 and a substation for $74,200. Clark County PUD has ordered work on a $400,000 office building in Vancouver and plans a 7,500-kva substation costing $100,000. Grant County PUD will spend $225,000 on its office buildings.

Cowlitz County PUD will spend $213,000 to construct an industrial substation and a 69-kv swicthing station, besides enlarging its Kelso substation. Grays Harbor PUD will build a $100,000 substation in the Aberdeen area.

Every 4-wheel-drive used for Highway driving should have

WARN HUBS

PATENTED

WARN HUBS

- REDUCE FRONT END WEAR 50% OR MORE!
- SAVE ENGINES!
- SAVE GAS, TIRES!

ASK YOUR DEALER FOR ***FREE DEMONSTRATION***

TO STOP FRONT END DRAG
when used in 2 w. d. range—

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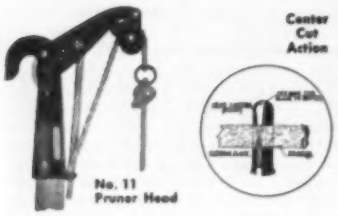

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BPA's New Dispatching Center

Bonneville Power Administration's new dispatching center, controlling power over a 200,000-sq mile area, went into operation last month in the Interior Bldg. in Portland, Ore. A dispatching board and telemetering instrument panels, sections of which are shown above, aid in the generation-control of the Columbia River basin hydroelectric powerhouse and transmission.

The dispatching board, 13½ ft high and 108 ft long, reproduces every important switch and control item in BPA's federal power system. Fifty-nine curve drawing telemetering instruments are mounted in the two end panels of the board. The 7,279,415-kva transmission system, handled by the center, embraces 6,800 sq miles of high voltage circuits and 168 substations.

The center, previously located at the J. D. Ross substation in Vancouver, Wash., is manned 24 hours a day from "L" shaped desks, each equipped with an 80-position telephone turret. Fluorescent lights mounted above a corrugated luminous ceiling, provide indirect, shadowless lighting.

Columbia Compact Stalled in Washington Legislature

The Washington State legislature will be given no opportunity to vote during the current session on the proposed Interstate Compact for development of the Columbia River.

A bill was introduced in the Senate which provided for approval of the compact. It was referred to the committee on state resources, forestry and lands, where a public hearing gave public power forces a chance to voice opposition to the measure.

Sen Harry Wall, committee chairman, subsequently announced the bill "will not be brought out of committee this session." The hearing indicated that legislators and the public at large had not been given enough time to study the compact and thus were unfamiliar with it, Wall said. Washington will continue to be represented on the Columbia Basin Commission that drafted the compact, however.

Of the other states which would be involved in the proposed compact, Nevada leads in action taken to date. The Nevada legislature has approved the compact, as has the Montana Senate. The compact is still in a Senate committee in the Oregon legislature and is ready for Senate action in Utah. The governor of Idaho has urged action in his state. Only Wyoming has yet to take some action.

Dedicates New Unit

Dedication of a new 44,000-kw generator was held recently at Jacksonville (Fla.) Electric Department's Southside plant. It is the first of two being added to the Jacksonville system under an $18-million expansion program.

B.C. Hydro System

Vancouver Island's demands prompt provincial body to build $19-million storage project

Faced with electrical "brown-outs" on Vancouver Island, British Columbia Power Commission will build $19-million hydro storage system which will merge Upper Campbell Lake and Buttle Lake into 30 mile-long reservoir.

This major two-stage project means:

1. A large dam will be built below outlet of Upper Campbell Lake, to raise lake level 79 ft, at cost of $9 million for completion by winter of 1956-57;

2. In 1958, the dam will be raised another 30 ft and 70,000-hp generating unit installed. This second stage will back water into Buttle Lake 15 ft over its normal high level and in effect make one large lake out of Upper Campbell and Buttle. Second stage will cost $10 million;

3. The new level of Buttle Lake actually will be 12 ft less than the original plan proposed a number of years ago and which resulted in drawn-out controversy over damming of Buttle Lake.

Dam will be 2,000 ft long in initial stage and about 110 ft high when second stage is completed. It will be 1,000 ft thick at base and be rock and dirt-filled with concrete spillway.

Storage To Be 800,000 Ft . . . In first stage, it will store 360,000 acre ft and in second stage an additional 440,000 acre ft, for total of 800,000.

Premier W. A. C. Bennett said increase in electrical loads on Vancouver Island has hit such a stride that the peak demand, predicted five years ago as likely to occur January, 1957, was actually reached last December.

The new water storage system, besides eventually providing for 70,000 on-site hp, will provide water storage for John Hart plant at Campbell River. This is desperately needed and even now shortage of water for John Hart generators is acute.

Campbell River system contains about 50% of the hydro power which had been utilized on Vancouver Island, and decision to place the dam below Upper Campbell Lake instead of just damming Buttle Lake as originally proposed, has come about as result of increasing power demands.

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Hearn Mishap Due

. . . to retaining ring failures in two generators, Gibbs of Parsons & Co, claims

Retaining ring failures caused the breakdown of the two large generators at Ontario Hydro-Electric Power Commission's Richard L. Hearn steam station, Toronto, last April, according to Sir Claude Gibb, chairman of C. A. Parsons & Co, England.

Gibb said there was no single factor which caused the failures. He explained that a combination of factors, never previously experienced together, led to a resultant stress which, repeated a sufficient number of times, brought about the failures. Failures occurred at only one end of the rotors. Other almost identical ends were unaffected and in perfect condition.

Gibbs revealed this data in an address made recently before Engineering Institute of Canada at Toronto.

Discusses Retaining Ring Strength . . . In elaborating further, he said holes, drilled through the retaining rings to allow cooling of the rotor windings, probably had a greater effect than expected in reducing the retaining ring strength. Because of the great thickness, the residual stresses locked in the material after forging were probably greater than previously experienced. Temperature variations, resulting from peak load operation, caused some increase in stress.

The two retaining rings or end bells which failed, could be said to have had "brittle fractures." Although this phenomenon, which has caused failures in high pressure gas mains, is not completely understood, its recurrence can be prevented. This is accomplished by eliminating stress concentrations, by using, if possible, a more ductile material which also has a greater notch toughness, and by reducing the general level of stress in normal service. All these changes have been made in the replacements for the Toronto generators.

Load cycle tests, performed with special oil pressure apparatus developed by Parsons, indicated that the number of loading cycles to produce failure was only slightly over a hundred. Theory and small scale laboratory tests indicated that thousands of cycles would be required.

Retaining rings were 58½ in. in diameter about 3 in. thick, and 21 in. long. They were made of the same special high strength alloy steel used by most generator manufacturers. This steel has considerable amounts of nickel, manganese, and chromium.

Each rotor is 56 in. in diameter, 13 ft long, and weighs 78.4 tons.

PG&E Expects to Start Kings River Work in '55

Pacific Gas & Electric Co hopes to be able to start construction this year on its proposed $75-million Kings River hydro project, the company has revealed.

The utility explained it has "substantially completed" agreements with irrigation interests on water storage and use which it expects to clear the way for final licenses from the Federal Power Commission and approval by the California State Public Utilities Commission.

Plans for development of the North Fork of the Kings River call for three new hydro plants and additions to a fourth for a 274,000-kw capacity.

The program will require three new dams—Helms, Wishon and Haas—and expansion of the existing Balch afterbay dam that will boost its height from 32 to 158 ft.

To obtain FPC approval of the project, PG&E had to agree to compensate local water users for loss of water that will be stored and to pay the Army Corps of Engineers for use of Pine Flat Dam as a re-regulating reservoir.

Water Shortage Continues

Snowshed surveys indicate continued water shortage is ahead for Arizona. A federal-state co-operative survey showed all watershed areas deficient in snowpack and snows lacking normal moisture content. Reserve supplies of the City of Phoenix and the Salt River Valley Water Users Association are threatened by drought conditions, the survey shows. Verde River storage is below the ten-year average and contains only 19% of capacity. The Tonto Creek and Salt River watersheds are equally deficient. Water storage in the Salt River system is only at 47% of capacity.

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☐ **Check contents** and locations of first-aid kits. Be sure they're adequate and up to date. Here, again, your CD Director can help. He'll advise you on supplies needed for injuries due to blast, radiation, etc.

☐ **Encourage personnel** to attend Red Cross First-Aid Training Courses. They may save your life.

☐ **Encourage your staff** and your community to have their homes prepared. Run ads in your plant paper, in local newspapers, over TV and radio, on bulletin boards. Your CD Director can show you ads and official CD films or literature that you can sponsor locally. Set the standard of preparedness in your plant city. There's no better way of building prestige and good community relations—and no greater way of helping America.

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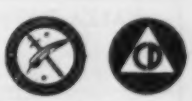

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Electric utility serving in the East desires a graduate electrical engineer experienced in testing and inspecting relays, carrier current and supervisory equipment. Should be familiar with short circuit calculations and A.C. and D.C. boards. Salary depending upon experience and ability. Applicants please give age, education and experience.

P-5832, Electrical World
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DISTRIBUTION ENGINEERS — Competent graduate electrical engineers with at least 10 years experience design, operation and maintenance of distribution facilities required by rapidly growing utility desirable location South America. Portugese or Spanish useful—not required to start. Reply stating age, education, experience, personal particulars and minimum salary expected. P-5859, Electrical World.

DISTRIBUTION ENGINEERS — Graduate Electrical Engineers — Senior — at least 10 years field experience with operating utility company. Junior 3 years experience. Permanent position long established consulting organization New York. Some travel Latin America necessary in future. Knowledge of Spanish or Portugese useful. Salary commensurate with experience. Reply stating age, education, experience, personal particulars and minimum salary expected. P-5860, Electrical World.

ELECTRICAL ENGINEER—Graduate with at least 5 years experience protective relay work with electric utility company, relay studies, system development studies and general technical electrical operating and design work. Permanent position long established consulting organization. Headquarters New York. Some travel Latin America. Knowledge of Spanish or Portugese desirable—not essential. Salary commensurate with experience. Reply stating age, education, experience, personal particulars and minimum salary expected. P-5861, Electrical World.

GRADUATE ELECTRICAL Engineers — one senior—two juniors—senior at least 10 years experience—junior 3 to 5 years experience in electrical design, operation and construction of steam, hydro plants and substations. Permanent position with long established consulting organization for public utility operating companies located Latin America. Headquarters New York. Some travel necessary in future. Knowledge of Spanish or Portugese useful—not essential. Salary commensurate with qualifications. Good opportunity. Reply stating age, education, experience and personal particulars. P-5862, Electrical World.

ELECTRICAL DESIGNERS and draftsmen. Minimum three years experience in the design of public utility steam power stations. Western Pennsylvania. Reply to P-5783, Electrical World.

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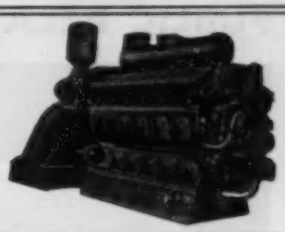

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1180	Worthington	SEH-6	1685	360	320	Superior	60E-6	480	450
1136	Fairbanks Morse	38D	1600	720	300	Fairbanks Morse	32E14	450	300
1100	General Motors	16-278A	1600	720	300	General Motors	8-268A	450	1200
1000	General Motors	16-567B	1440	720	250	Clark	GID-8	375	360
750	General Motors	12-567	1080	720	200	General Motors	6-268A	250	800
700	Worthington	EE-6	1000	327	175	General Motors	12-71	275	1800
675	Fairbanks Morse	38D	990	720	150	Buckeye	80	240	600
500	General Motors	8-567	720	720	148	Fairbanks Morse	32E14	220	300
500	Alco	6-12¼x13T	710	400	100	General Motors	3-268A	150	1200
350	Baldwin	VO-6	510	450	80	General Motors	6-71	90	1200
320	Enterprise	DSG-6	480	450					

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GRAD. ENG., 20 yrs. exp., Elect. Const., utility operation and const., and plant elect. maint. Want challenging work. Will relocate. PW-5395, Electrical World, 520 N. Michigan Avenue Chicago 11, Illinois.

FIELD ELECTRICAL engineer, 30 years experience, construction power houses, transmission lines, distribution systems. Will travel domestic or foreign. Fluent in Latin languages. Available immediately. PW-5722, Electrical World.

GRADUATE ELECTRICAL engineer, 31 years of age with two years experience as resident engineer in REA work and five years as engineer for public utility in operations, maintenance and construction work. Will relocate. PW-5693, Electrical World, 520 N. Michigan Avenue, Chicago 11, Illinois.

SUPERINTENDENT OF transmission and distribution desires change of location. Graduate electrical engineer, familiar with all phases of overhead line design, construction, and maintenance. PW-5796, Electrical World.

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SALES ENGINEER — manufacturers agent, Cleveland, 20 years experience contacting utilities, contractors, large industrials, wants 1 or 2 good lines. RA-5814, Electrical World.

PERIODICALS

A.I.E.E. transactions back-volumes wanted to buy for cash. Ashley 24 E. 21, N.Y.C. (10).

U. S. Government

DEPARTMENT OF THE INTERIOR, Bureau of Reclamation. Sealed bids (Invitation No. DS-4363), will be received at Denver, Colorado, until April 19, 1955, for furnishing one 154- to 69-kv, 30,000/40,000-kva, 3-phase, class OA/FA, outdoor autotransformer, having a 4-kv, 6,660/8,880-kva (external load) tertiary winding, for Gila Substation, Parker-Davis Project, Arizona-California-Nevada. Delivery is desired within 300 days. For particulars, address Bureau of Reclamation, Building 53, Denver Federal Center, Denver 2, Colorado. W. A. Dexheimer, Commissioner.

DEPARTMENT OF THE INTERIOR, Bureau of Reclamation. Sealed bids (Invitation No. DS-4358), will be received at Denver 2, Colorado, until April 12, 1955, for furnishing control boards, supervisory control and telemetering switchboards, and carrier-current equipment for Fargo and Jamestown Substations for Missouri River Basin Project, North Dakota, Transmission Division. Delivery is desired within 300 days. For particulars, address Bureau of Reclamation, Building 53, Denver Federal Center, Denver, Colorado. W. A. Dexheimer, Commissioner.

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3 phase, 60 cycle, 220 or 440 volts
(*2300 volts or higher)

HP	MAKE	TYPE	P.F.	SPEED
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720	*Westg.		1.0	900
710	*G.E.	ATI	1.0	720
600	*G.E.	TS-7660	1.0	900
500	*G.E.	TS-7657	1.0	514
400	*Westg.	M	.8	1800
400	West	MG	1.0	900
350	G.E.	ATI	.8	720
300	*Ideal	SMM	.8	257
300	G.E.	ATI	.8	1200
250	G.E.	ATI	.8	900
250	G.E. (New)	TS-8747	.8**	720
225	G.E.	TS-8244	1.0	600
225	Elec. Mach.		1.0	360
200	F. Morse	TJC-285	.8	720
150	Elec. Mach.		1.0	720
150	F. Morse	TJC-285	.8	720

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FOR SALE

3—1000 Kva W-H 20000/3465OY-13200
6—1000 Kva Mol 11500-2400/4160Y
3— 833 Kva G-E 35000—480
3— 500 Kva G-E 26400—240/480
5— 333 Kva W-H 38000-7200/12470Y
3— 333 Kva G-E 33000-2300/4000Y/6900/-11950Y
3— 333 Kva G-E 33000-2300/4000Y
3— 333 Kva Mol 7200/12470Y-2400/4160Y
3— 150 Kva G-E 19050/33000Y-2540/4000Y
3— 100 Kva G-E 33000-6900/11950Y

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U. S. Government

DEPARTMENT OF THE INTERIOR, Bureau of Reclamation. Sealed bids (Invitation No. DS-4372) will be received at Denver, Colorado, until April 19, 1955, for furnishing thirty-three (33), 230-, 115-, 69-, and 46-kv, 1,200- and 600-ampere, 3-pole air switches; twelve (12) 15-kv, 2,000-ampere, 1-pole air switches; and six (6) 46- and 14.4-kv, 10,100- and 4,500-rms amperes, 1-pole, fused disconnecting switches for Fargo Substation, Transmission Division, Missouri River Basin Project, North Dakota. Delivery is desired within 210 days. For particulars, address Bureau of Reclamation, Building 53, Denver Federal Center, Denver, Colorado. W. A. Dexheimer, Commissioner.

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PUBLIC RELATIONS & ADVERTISING

A Warning to Watch The Tax Dollar

Electric Companies Advertising Program advertisement for April reminds taxpayers that while they might not willingly contribute to advance of socialism, they can do so through their tax money. Every time the government builds another power plant, and there are persuasive groups urging this course, it is doing something which private enterprise is ready and willing to do.

This advertisement will appear in April issues of such nationally circulated magazines as American, Collier's, and The Saturday Evening Post.

SCANNING THE ADS

Carolina Power & Light Co plugs for adequate wiring in two ads. First is captioned "Too Big for Your Switches?" and shows growing child in undersized snowsuit. Second is captioned, "Table for Two Won't Do for a Dozen," and shows man and wife at a small table and another drawing of same man and wife at long table with ten children. In both ads is a checklist for symptoms of sick wiring.

Connecticut Light & Power Co—"Big Bargains Balance Budgets" is title of an ad stressing low cost of electricity. Illustration shows housewife balancing a silver dollar on one finger.

Georgia Power Co—Another in its series of community development ads features a cartoon of two business executives plotting their sales potential on a map. You guessed it. Sales potential is greatest in Georgia so that's where the execs will open a new plant.

Kansas City Power & Light Co—Full-page ad is headed "Marching Towers of Power . . . to serve Kansas City". Illustration shows giant steel tower transmission line bringing power from the $125-million Montrose Station which the utility will begin building this month.

Sargent Brings Arizona To N. Y. Press Dinner

Arizona came to New York early this month when Pres Henry B. Sargent of Arizona Public Service Co introduced his 1954 annual report to the New York financial press.

The group was treated to an all-Arizona meal (except for the water, coffee, and Burgundy wine), and presented with an attractive folder of materials plugging the state.

With the object of turning out a report that can draw the readership of a comic strip, APS has freely illustrated its pamphlet this year with two comic strip characters, "Gordo" and "Pepito," in conjunction with Reddy Kilowatt.

Duck to Chase Kites From Utility Lines

Pacific Gas & Electric Co has sworn in Donald Duck, the Walt Disney cartoon character, to help keep its power lines free of kites during the coming flying season. Beginning last month, the utility distributed thousands of copies of an eight-page comic book on kite flying safety, starring Donald Duck and featuring his three trouble-making nephews, Huey, Dewey and Louie.

The colorful, fast-moving story is aimed at teaching safety rules for kite flying. Among the rules dramatized: Never fly a kite near electric power lines. Never use tinsel string, wire or any twine with a metallic substance.

Booklet for 9th Graders

A booklet, "Living With Electricity," has been prepared by a committee of teachers of Dayton, Ohio, public schools working with Dayton P&L. It is designed for pupils of the ninth grade level. Fred H. Dettmar, manager of DP&L information services, reports he is prepared to obtain prices from the printer on any orders that other companies might wish to place for this booklet for local distribution. For free copy, write: Public Information Program, 2 West 45th Street, New York 36, N. Y.

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READERS FORUM

It's the Man Who Counts

To the Editor:

I have been a reader of the Electrical World since 1924 and am sincere in stating that I owe as much credit to your publication for keeping me abreast with the ever changing electrical engineering practices as I do to the text books and handbooks on the same subject. During these past years I have occasionally experienced the impulse to write my appreciation for timely articles on electrical distribution problems but never followed through. The past few years Electrical World has occasionally thrown a few barbs, both editorially and in news commentary, which have finally stung me into action.

I refer to the suggestions that publicly owned power organizations operate under "incompetence, patronage, and waste." It seems to me that this sort of propaganda will lead the public to think that regardless of a person's qualifications if he is connected with a publicly owned power system, he must be incompetent, play politics, and carry on his responsibilities in a wasteful manner.

I have been associated with both privately owned and publicly owned utilities, and my experience has been that they both work toward the same goal of supplying the people they serve with reliable and efficient service at all times. In the operation of a public utility I do not see how it could be otherwise regardless of who owns it.

Electrical engineers have always accepted the challenge to make electrical development responsible for a more abundant life for every one.

Political intrigue may crop up in either type of organization. Past history has revealed this to be true, but the technical men have never become involved. They have been too busy working for the general welfare of the public they serve. Recognition should be given to the worth of such men, and I do not think the recognition should be predicated on whether they are connected with a private organization or one that is publicly owned.

Emil Scolari
Manager

Lompoc Light & Water Department
119 West Walnut
Lompoc, Calif.

● Mr Scolari, we agree with you wholeheartedly.

PUC's Recognize Inflationary Trends

To the Editor:

Since my article (PUC's Urged to Consider Budgets in Setting Fair Treatment of Rates, EW, Feb. 14, p40) was prepared, there have been several cases in which public utilities commissions have given recognition to inflationary trends. Particularly, I have in mind an order last November of the Arizona Corporation Commission making an allowance for the demonstrated progressive decline in net earnings for a reasonable period in the future.

An even more recent order of the Massachusetts Department of Public Utilities in connection with the New England Telephone & Telegraph Co made allowance for the declining trend of earnings up to the date of the commission's order, which was beyond the test period used for other purposes in the case. Also, an order of the New Mexico Corporation Commission involving this company, issued in December 1954, was based upon the property and level of earnings as projected to Dec. 31, 1954.

P. E. Remington
Vice President

Mountain States Telephone & Telegraph Co
Denver, Colo.

● The editors hope that this trend of the public service commissions to recognize the inflation which confronts the utility industry today will continue. The use of budgeted or projected figures has especial merit because rates are set for the future and not for the past.

Light Duty Cords Must Be Made Safe

To the Editor:

The letter from Mr Harold G. Cooper which you published in the Feb. 21 issue (page 197) entitled, "The Fuse Isn't Always the Weakest Link," makes a realistic approach to a time-honored problem. In the majority of cases where the cause of a fire is listed as defective wiring, the "defect" actually exists in some individual, in the way the wiring was installed, or the way in which the appliances and cords were used or abused.

Fifty years ago, rosettes for drop lights were fused—individually—and the capacity behind those outlets was peanuts as compared to that which is available today. Several manufacturers have already produced fused attachment plugs, but until the National Electrical Code authorities made their use mandatory with light duty cords, the cheap plugs now on the market will continue to be used.

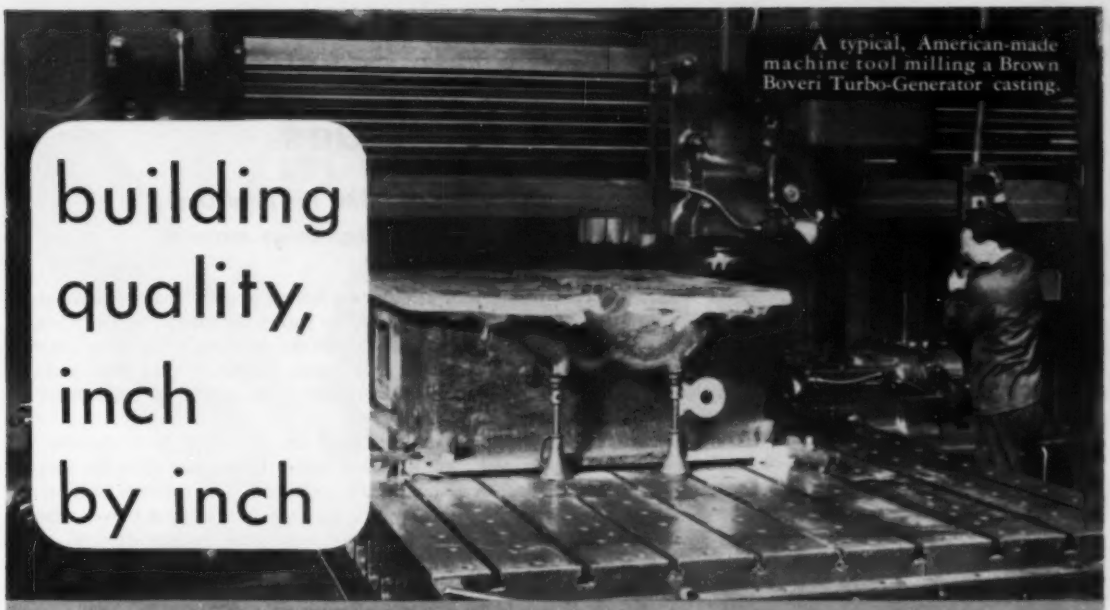
One type of point-contact lever-operated outlet designed for use with No. 182-wire light duty cord actually carries a rating of 15 amp—imprinted on the body—and I have been given to understand that nothing needs to be done about it! Is it any wonder that the public becomes confused at times when some of our best soap-box orations are contradicted in black and white on the devices bought off the counter in stores?

A forward step has recently been taken in requiring that new wiring provide a grounding terminal at the outlet where the location is exposed to grounded surfaces and that many appliances be provided with 3-wire cords and plugs for grounding purposes. If the manufacturers and the Code authorities will get together and do something about the light duty cords and various related devices which are now flooding the market, another forward step will be taken and many an innocent and unsuspecting person will be saved from untold suffering.

Lloyd N. Benner
Member

International Association of Electrical Inspectors
5 Thompson Street
Brunswick, Maine

● It is to be hoped that the industry will be quick to attack and solve this problem.



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EVERY Brown Boveri Turbo-Generator is *an enduring monument* to the outstanding skills of Brown Boveri engineers and craftsmen. The power generating equipment they design and build is world-famous for quality, and consistent, year-in-year-out performance. In fact, many Brown Boveri Turbo-Generators are still in active service after more than thirty-five years of continuous, daily operation.

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WASHINGTON COMMENT

Democrats Search for Power Issues

Fight over Dixon-Yates contract has apparently fizzled. Now the New Dealers are turning to other electric power matters for 1956 campaign material

The Eisenhower Administration's power policies have never been popular with the Democrats, but until this session they haven't had much chance to do anything about them. Democrats in Congress have built up quite a head of steam over the last two years particularly over the Dixon-Yates matter. During the early days of this session they hissed and whistled in a way that threatened an outright explosion.

They haven't exploded yet, and maybe they won't. But apparently they feel they've thrown around enough dirty words on Dixon-Yates to create an atmosphere receptive to their views on power. Anyway here's a sizeup of current activity:

• The House Interior Committee is raking the Administration over the coals on power policies. Members were set last week to give Budget Director Rowland Hughes a rough time over the "partnership" power program and the new method of allocating costs on multipurpose water projects. The new cost allocation formula is the system used for years by the Army Corps of Engineers which is somewhat more realistic than the system used by the Interior Department. Effect of adopting the system will almost certainly mean higher federal power rates.

• The General Accounting Office—the independent federal agency which audits all other government departments—has just advocated making the cost allocation method a legislative matter. This would remove the Administration's jurisdiction over cost allocations. Expect the Democrats to move in on this suggestion.

• Democrats reacted violently to a report by the Interior Department which found that private development of power on the Trinity River in California is feasible. This, in effect, reverses the old Reclamation Bureau suggestion that Trinity be a federal project. Interior Secretary Douglas McKay is to go before the House Interior Committee March 30 to explain this decision. Committee Chairman Clair Engle, a California Democrat, has a stake in this project, and he'll make a lot of noise over the Department's report.

• Thirty senators have already joined in sponsoring a bill to put up a federal dam at Hells Canyon on the Snake River in Idaho. Idea is to beat the Idaho Power Co to the punch. The company has asked the Federal Power Commission for a license to build three smaller dams in the same area, and the case is going well for the company. The predominately Republican FPC is getting ready to rule on the Idaho Power application.

The big federal Hells Canyon bill is the brainchild of Oregon Senator Wayne Morse, former Republican and former Independent who has now gone over to the Democrats. He is a violent public power advocate, and he's working on the assumption FPC will okay the company application. His objective is to ramrod the bill through Congress before FPC acts.

There's a chance he may get it through the Senate even though he's only obtained the signatures of two Republicans so far. But its almost certain to be blocked in the House. There a New York-California-Pennsylvania coalition can easily spike the Morse plan. This would mean the license would be issued.

So far, then, the Democrats' attack on the Eisenhower policies seem just noisy. They created a tremendous furor over Dixon-Yates, but apparently they've lost that battle.

The current series of attacks may be no more successful. But they can't be entirely discounted because they may yet prove to have a bearing on the 1956 elections.

TECHNICAL NOTES

Perfect crystals of pure iron are some 100 times stronger than any known metallic crystal. Tests confirm the theory that this would be the case.

Preheating of generator field windings should be done with the unit at 25 to 33% rated speed and with excitation at 75 to 95% of normal full-load field current. Excitation must be from a separate source because a direct-connected exciter would be at inadequate speed.

Electromagnetic forces between bus conductors under short-circuit conditions can be reduced by large factors, eg 10 or 20 to 1, by enclosing each in a properly designed sheath.

Rising voltage characteristic not wholly unlike that of a dc compound generator can be derived by combining a series capacitor with a transformer.

Titanium carbide for critical parts has enabled gas turbine operation at 1,900 F and 30,000 rpm.

Millimeter wave generators use atom-smasher techniques to work in frequency-spectrum wilderness between microwaves and visible light.

Isochronous governing would force a unit to take all the load swings unless the tie-line regulators were set to limit interchanges of power.

Wherever corrosion is a problem New G-E White Conduit is your answer

INDUSTRIAL FUMES
When subjected to 42 days in ammonium hydroxide and to 150 hours in sulfuric acid, the new G-E White demonstrated excellent corrosion-resistant qualities.
ACID VAPORS
Conduit samples were tested for 150 hours in hydrochloric acid, as well as 150 hours in sulfuric acid, proving G-E White's unsurpassed resistance to chemical fumes.
HEAT AND HUMIDITY
An extreme test of 42 days in 100% humidity at 105° F indicated G-E White conduit to be very suitable for warm, moist locations.
SALT SPRAY
Results of 1000 hours in a 20% solution of salt spray at 95° F showed that G-E White conduit is ideal for salt water atmospheres.
G-E WHITE

Six months of grueling laboratory and field tests show that a G-E White rigid steel conduit installation offers improved corrosion-resistance. This improved protection is a result of the metallizing process used for zinc galvanizing on G-E White. Metallizing bonds a controlled, non-flaking coating of zinc to the entire exterior of the conduit — threads and all. The inside is protected, too, by a special organic coating that produces a smooth, stable surface. G-E White conduit is listed by Underwriters' Laboratories, Inc., meets Federal Specification WW-C-581b.

Contractors and maintenance men like the many features, such as easy bending and wire-pulling, that speed installation. For more information write Section C44-327, Construction Materials Division, General Electric Company, Bridgeport 2, Conn.

Progress Is Our Most Important Product

GENERAL ELECTRIC

Future Storm Costs Denied

Massachusetts DPU turns down New England T&T's request to be allowed more net earnings for coming hurricane damages

The Massachusetts Department of Public Utilities has recently rejected the contention of the New England Telephone & Telegraph Co that it be permitted additional net earnings for future hurricane damage.

The order said in part "On August 31 and again on Sept. 10, 1954, petitioner's facilities were badly damaged by the hurricane which swept over this area on those days. The estimated result was to decrease petitioner's net intrastate telephone earnings for the year by $1,648,000. This difference represents the amount charged to maintenance during the year in excess of the company's estimates, after taxes. It does not, of course, take into account the very large amounts charged to capital expenditures as the result of these catastrophes, and is obviously a non-recurring maintenance item."

Earnings Normalized

"In the ordinary course, we would normalize the company's earnings to exclude this extraordinary maintenance in computing operating results for the purpose of establishing future rates. The petitioner has charged such amounts against expense for the year and has not set up any extraordinary reserve to be amortized over a period of time, as has been the practice of some utilities in dealing with extraordinary expenses or retirements.

"However, it asks us to assume that catastrophes of this nature are not unexpected and demands that we permit it to charge rates which would result in a credit to surplus in excess of that which we would otherwise permit in an amount equivalent to one-fifth of this extraordinary maintenance item.

"It is true that petitioner suffered heavy damage from severe storms in 1938, 1944, and again in 1954, which averages out to about once in five years. However, petitioner's witnesses were unable to point out any storms of comparable severity during the period from 1900 to 1954. Whether there actually were such, we do not know and cannot find. At any rate, it seems to us that we cannot assume that such storms as were experienced in 1954, which were unprecedented in extent and fury, are necessarily going to be repeated on an average of once every five years hereafter.

"We do not feel competent to make such a prophecy nor do we have any evidence on which we could base such a finding. We repeat that there is no request here for amortization of an extraordinary item, which would mean that earnings would be restated at the end of the amortization period.

"This is a request for an allowance of additional net income for an indefinite period in the future and, in the event of future rate cases, we assume that we would be asked to make allowance accordingly regardless of intervening experience. We do not believe that this is the way to treat matters of this nature and we will not modify our findings to allow for such future damage."

The order concluded that since the company was not making an allowable return of 6.25% that it should be permitted ". . . to collect $5,515,000 in additional gross annual revenues over and above the amounts which it is presently collecting under bond."

Wyoming Legislature Kills REA Tax Exemptions

The Wyoming Legislature killed a bill that would have extended the property tax exemptions given Rural Electrification Association since 1949.

REA's had been exempt from property taxes under a law enacted by the legislature six years ago. That law expired Feb. 15, 1955.

The Wyoming House passed a bill to extend the exemptions for two years but the Senate defeated the proposal, 13-12, after an hour of debate on the final day of the session on Feb. 19.

Sen L. A. Bowman, Big Horn County Republican who led the opposition, declared REA's have been expanding in competition with private utility companies and should be subject to taxation.

PUC Revisions Asked By Pennsylvania Bills

Bills backed by Pennsylvania Gov George M. Leader to require the state Public Utilities Commission to hold public hearings on all rate revisions was introduced in both branches of the legislature recently by Democratic members.

The measures would make it mandatory that rate case hearings be held within 60 days from the time of filing the new rates. The PUC is now permitted to hold hearings at its own discretion.

The new bills also would require that complete schedules of rate revisions be filed with local municipalities affected and with other interested parties.

Under the proposed legislation, current rates would not be permitted to change for a period of six months following the time the rate change is filed. The PUC could at its own discretion extend those rates another six months pending a final decision of the new schedule.

In further proposing revision of PUC procedure, the bills declare that fair value of a utility, used as a rate base, would be determined by considering the original capital investment of the utility less depreciation. The PUC now determines fair value somewhere between original costs and replacement costs, less depreciation.

Idaho Utility Cuts Rates

The Citizens Utilities Co of Wallace, Idaho, has agreed informally to reduce its residential rates in the Wallace area about 12% pending a hearing by the state Public Utilities Commission in late April or May.

The PUC received a petition bear-

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portable fire extinguishers . . . built-in fire detecting and fire extinguishing systems

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ing 625 signatures complaining that the utility company's rates were too high. The rate cut means a saving of $20,000 to $25,000 annually for consumers of the area, in the heart of the Coeur d' Aelene mining district.

Bi-Monthly Billing

City Light customers at Tacoma, Wash., will pay their bills every other month, beginning in April, as the result of action by the Public Utilities Board. The new billing method, which covers garbage collection, water and sewer bills as well as light, will save approximately $100,000 a year, according to Utilities Director Dean Barline.

FINANCIAL BRIEFS

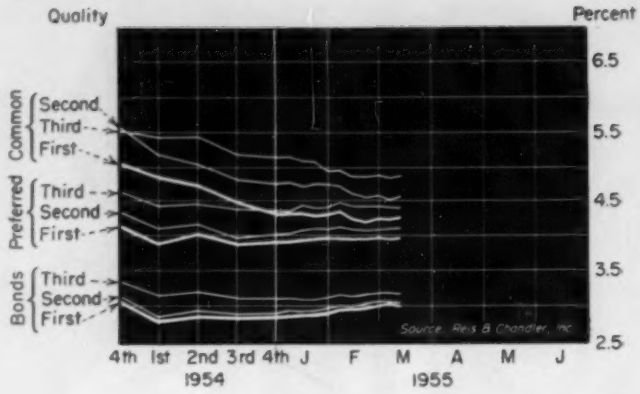
Peach Lake Utilities, Inc, has received New York Public Service Commission approval to take over operations of Pabst Electric Co which formerly submetered service to both year-round and seasonal residents of a private resort area located within the general service area of New York State Electric & Gas Corp, buying its power from that firm . . . **Lake Superior District Power Co** stockholders at their annual meeting on April 5 will be asked to approve a common stock split on the basis of one share of $20 par into two shares of $10 par.

REGULATION BRIEFS

Rates charged by utilities operated by municipal authorities in Pennsylvania would come under the jurisdiction of the Public Utilities Commission under the terms of a measure which has been introduced in the General Assembly by Rep Anthony J. Petrosky (D—Westmoreland County).

Akron, Ohio, City Council has approved Ohio Edison Co's request for a 10% boost for the next two years in street lighting rates. This will amount to about $34,000 with $24,000 to be paid by property owners and the rest coming from the city's general fund.

Today's Utility Yields (%)



	BONDS			PREFERRED STOCKS			COMMON STOCKS		
QUALITY	1st	2nd	3rd	1st	2nd	3rd	1st	2nd	3rd
Mar. 10	3.01	3.05	3.18	3.96	4.11	4.40	4.27	4.58	4.88
Mar. 3	3.02	3.04	3.17	3.94	4.10	4.39	4.22	4.51	4.82

Utility Earnings

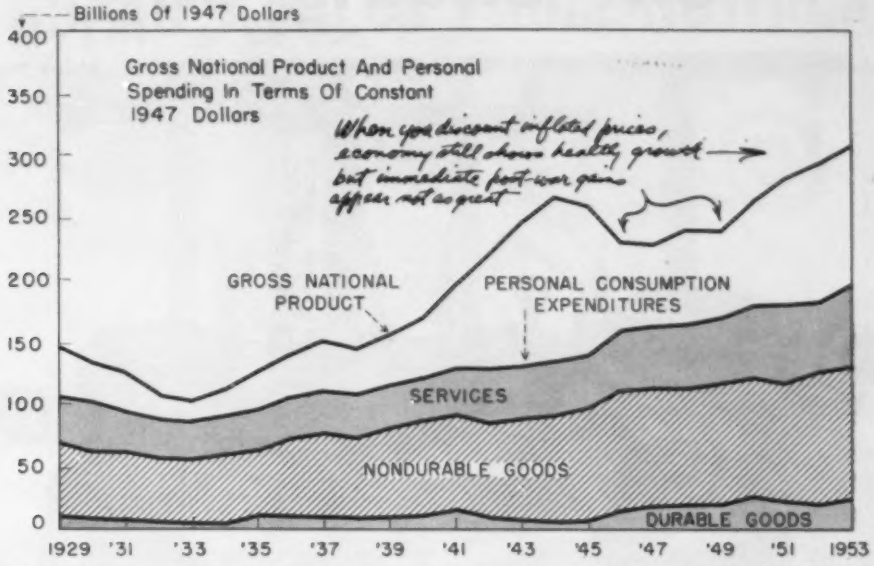
COMPANY	PERIOD MONTHS	ENDED	NET INCOME 1954	NET INCOME 1953	EARNINGS PER COMMON SHARE 1954	EARNINGS PER COMMON SHARE 1953
Atlantic City Electric	12	Dec.	$3,907,497	$3,261,603	$2.11(a)	$2.05(a)
Central Hudson Gas & Electric	12	Dec.	3,100,607	2,661,124	1.02(a)	0.96(a)
Central Illinois Light	12	Dec.	3,535,701	3,236,251	3.03	2.73
Connecticut Light & Power	12	Dec.	9,103,019	7,721,888	1.17(b)	1.03(b)
Consolidated Gas of Baltimore	12	Dec.	12,140,596	10,141,436	1.95(a)	1.74(a)
Hartford Electric Light	12	Dec.	3,692,950	3,435,223	3.54	3.70
Interstate Power	12	Dec.	2,592,781	2,432,787	0.97	0.91
Iowa-Illinois Gas & Electric	12	Dec.	4,303,784	4,817,423	2.04	2.41
Iowa Power & Light	12	Dec.	3,921,227	3,917,546	1.83	1.94
Pacific Power & Light	12	Dec.	5,780,000	6,120,000	....	....
Philadelphia Electric	12	Dec.	30,889,079	29,779,238	2.34(a)	2.38(a)
Public Service of Indiana	12	Dec.	12,175,837	11,751,619	2.38	2.34

Notes—All the figures shown above have been audited; (a) Based on average number of shares; (b) Based on 6,195,818 shares in 1954 and 5,892,576 shares in 1953.

Utility Financing

COMPANY AND DESCRIPTION	AMOUNT OF OFFERING (000)	OFFERING PRICE	YIELD TO PUBLIC
MARCH 10-18			
BONDS			
Kansas Gas & Electric—1st mtg 3¼% due 1985	$10,000	102%	3.27%
PREFERRED STOCK			
Kansas Gas & Electric—60,000 sh 4.32% $100 par	$6,000	$101.64	4.25%
Southern Nevada Power—75,000 sh 4.80% $20 par conv.	1,500	20.25	4.75
SCHEDULED FOR MARCH			
BONDS			BID DATE
Arkansas Power & Light—1st mtg due 1985	$18,000	.....	Mar. 30
COMMON STOCK			
Oklahoma Gas & Electric—331,643 sh (to be offered commonholders on a 1-for-8 basis, record Mar. 16 to expire April 5)	.....	.....	.....
Florida Power & Light—305,000 sh	.....	.....	Mar. 29
Arkansas Missouri Power—36,868 sh (to be offered commonholders on 1-for-12½ record Mar. 14 basis without underwriting)	.....	.....	.....

STATISTICS



Power Statistics . . .

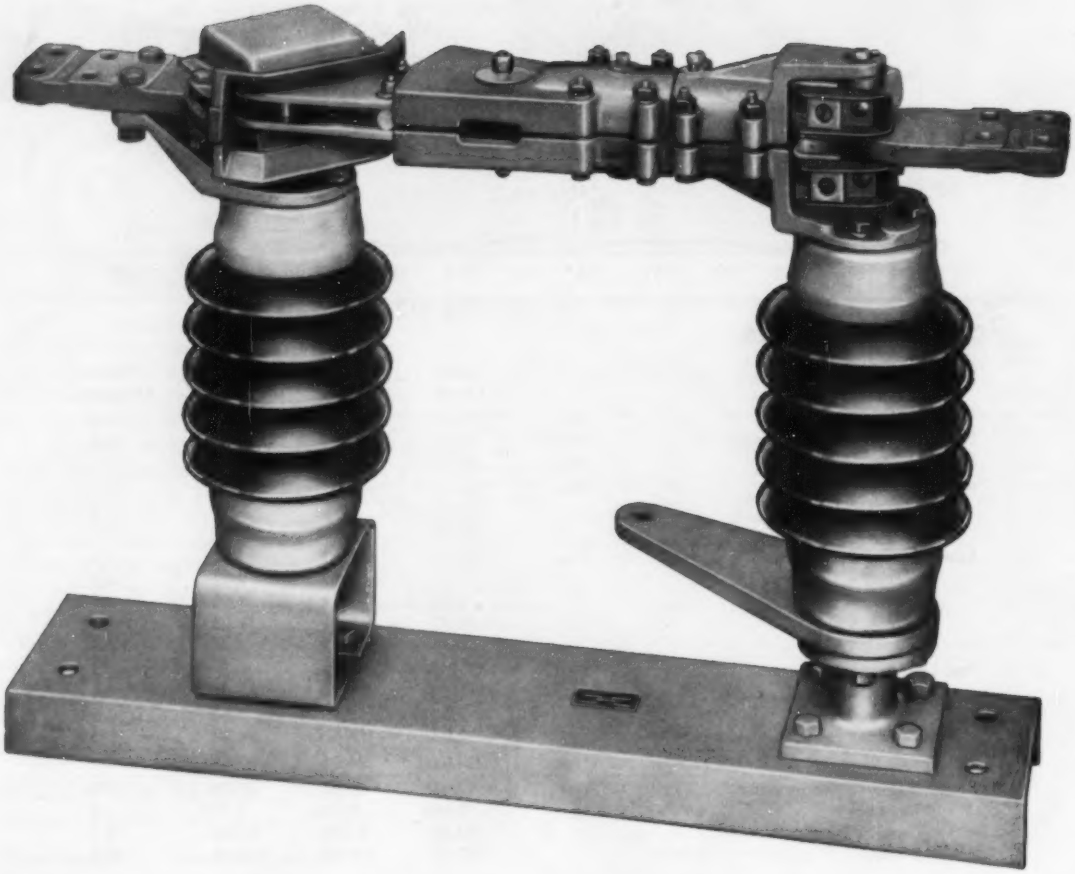
		Latest Month	Preceding Month	Year Ago	Annual Change %
Capacity, Peak—Class I Systems, Estimated Dec. '55 Peak — million kw	Jan.	103.62	102.52	91.68	13.0
	Dec.	85.5	81.9	78.6	8.8
	Dec.	95.9	96.1	97.6	−1.7
Production—billion kwhr	Dec.	43.43	40.22	39.08	11.1
hydro		9.05	8.12	8.67	4.3
fuel		34.38	32.10	30.41	13.1
Sales—billion kwhr	Dec.	35.25	33.87	32.31	9.3
residential		11.15	10.07	9.77	14.0
Commercial		6.22	6.14	5.60	8.5
industrial		15.57	15.38	14.83	6.8
other		2.30	2.29	2.12	7.5
Fuel Consumption	Dec.				
coal—million tons		11.90	10.70	10.88	9.4
oil—million barrels		7.67	5.82	7.62	0.6
gas—billion cu ft		74.93	88.66	70.94	5.6
Net Income Class A & B Co's—$ million	Nov.	94.91	86.98	83.86	13.2
Residential Customers—millions	Dec.	43.14	43.04	41.98	2.8
revenue per kwhr		2.69¢	2.70¢	2.74¢	−1.8
avg. kwhr per customer		2,549	2,528	2,346	8.7
avg. annual bill		$68.57	$68.26	$64.28	6.7

Business Statistics . . .

Indexes: 1947 − 49 = 100					
FRB Industrial Production	Jan.	130	128	124	4.8
ENR Construction Cost	Feb.	135.1	135.1	128.9	4.8
BLS Cost-of-living	Jan.	114.3	114.3	115.2	−0.8
NEMA Sales	Dec.				
insulation materials		138	124	133	3.8
electric appliances		84	90	69	21.7
household refrigerators		62	47	53	17.0
Wholesale prices	Jan.				
motors and generators		121.6	121.8	124.3	−2.2
transformers and regulators		128.1	128.1	128.1	....
switchgear and fuses		135.3	135.3	135.1	0.1
GNP—annual rate—$ billion	4th Qtr.	362.0	355.5	360.5	0.4

Cole Electric Co.

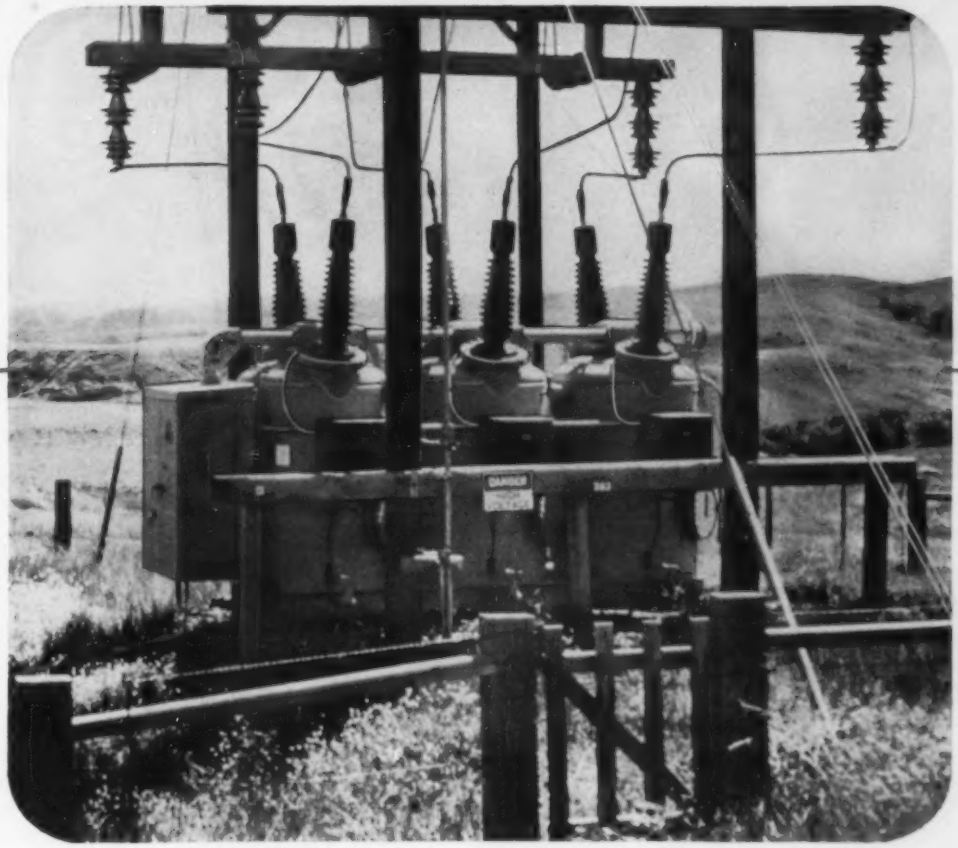
8439 Steller Drive TExas 0-4701 Culver City, Calif.



OUTDOOR DISCONNECTING SWITCH
15,000 Volts—1200 Amperes—Type LU
Side Break—Three Pole—Single Throw—Group Operated
SILVER TO SILVER CONTACTS
One Pole Shown

See Bulletin 42A

ON GUARD..."MILES FROM NOWHERE"



Federal Pacific RHE-64-H Circuit Breaker, 115 kv, 3500 mva, installed on the prairie, Garrison Dam, North Dakota

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Federal Pacific Breakers have four big advantages that eliminate the need for scheduled maintenance:

★ Nothing operates except when the breaker operates;

★ Their energy requirements are extremely low;

★ With no power available, they can be operated by manually storing energy for full-speed closing;

★ They can be operated for extended periods of time, even without space heaters in sub-freezing temperatures.

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Federal Pacific RHE Circuit Breakers are available in a range from 115 to 330 kv, 3 or 5 cycle opening-20 cycle reclosing, to 15,000 mva interrupting kva. For full information, write for Catalogs.

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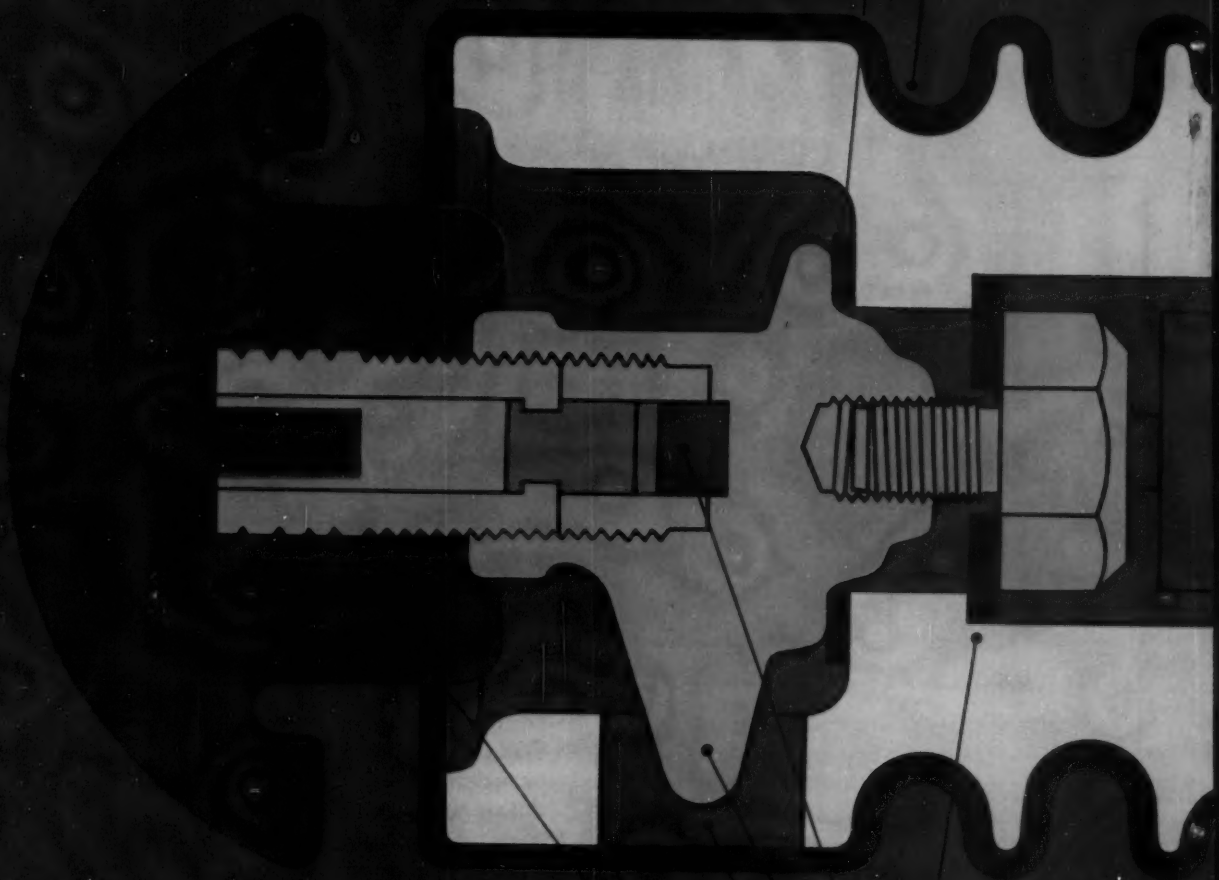
QUICK-PRIME BUSHINGS—
a KUHLMAN first*

a twist of the knob completes the job


Compound sealed prevents oil leakage.
Corrugations designed for ample creepage distance independent of position or angle of mounting.
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Cable can be entered from two sides.
Electrode for isolating gap to arrester in protected transformers and co-ordinating gap in conventional transformers.
Bushing gap terminal.
Hard rubber knob prevents accidental contact with cable.

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